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Master's Thesis

Bibliometric Study of Digital Accounting Linked with Pedagogical View

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Abstract

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The purpose of the research was to investigate written scientific articles about digital accounting from the pedagogical perspective in scientific journals during the time frame 2000-2017. The research questions were How are articles placed in time?, Has the research concentrated on specific researchers, journals or institutions?, What are the most important (the most cited or otherwise high quality) articles about the topic?, What has been studied about digital accounting from the pedagogical perspective?, What research methods and data have been used?, and What areas could be interesting for future research?.

To address the objective of the research bibliometric analysis was applied as a research method. For the analysis, the final set of 46 articles related to the topic was defined based on the search results in Sciverse Scopus database and selection procedures.

The results of the thesis were the answers on the research questions. Along with other findings, areas for future research in the field were identified. The results can be applied as support for further scientific papers.

Keywords: digital accounting, accounting education, pedagogy, bibliometric study

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Artem Barashyan

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1 Introduction

1.1 Background

Questions about the ability of education to meet the demands of practice were raised by the changing business environment. Likierman (2004) argues that "academics tend to work in isolation from practice, which means they are not addressing the problems that practitioners face in their day to day jobs". Previous research on accounting skills by Kavanagh and Drennan (2008), Jackling and de Lange (2009), Marshall, Dombroski, Garner, Smith (2010) and Low, Botes, Rue, Allen (2016) have brought attention to an 'expectation gap' triggered by graduates leaving university without the skills and attributes that employers expect. Studies by Bowden and Masters (1993) and Albrecht and Sack (2000) claim that the gap between education and practice is widening. (Botes & Sharma 2014, p. 2.)

Parker (2002) expresses concern about the ability of university accounting education to prepare students to meet future business demands and Ryan (2004) states that higher education has not transformed fast enough to keep pace with the changes taking place in the business world. Kaye (2004) points out that few academics have kept up to date with the changing business environment, which raises serious concerns about academia's ability to teach candidates adequately for today's business challenges. Tucker and Lowe (2014) note that academia and practice are 'worlds apart' so much that some observers are skeptical about whether a close relationship is possible, or even desirable. Tucker and Lowe (2014) suppose that for many scholars, disconnection between academic world and practice is still the prevailing experience. Albrecht and Sack (2000) and Craig and Amernic (2002) declare that education is useful for helping people to think and know things, but fails to train students to deliver on work-based projects – in other words, 'how to do things'. According to Bui and Porter (2010) while employers appear to believe that universities should prepare students to become competent members of the workforce, most academics consider that universities have a key role in developing students' intellectual capabilities and their ability to 'challenge

conformity and convention' and think independently. In the latter study, employer interviewees expressed different expectations concerning accounting graduates possessing thinking skills (i.e. independent thinking and problem-solving skills). (Botes, & Sharma 2014, p. 3.)

In an attempt to address the gap, numerous studies have focused on the attributes and skills required from accounting graduates and have proposed changes in tertiary curricula (Botes, & Sharma 2014).

1.2 Literature review

Holmes (2002) states that the skills agenda has been widely debated throughout the past decade. Many studies have cast a broad net in terms of the stakeholder groups, but examined generic skills not necessarily specific for accounting graduates or the accounting profession. Within the accounting profession, competitive pressures and technology have led to expectations that accounting graduates demonstrate additional competencies with increasing importance given to non-accounting capabilities and skills. These capabilities and skills are significant because they enable the professional accountant to make successful use of the knowledge gained through education. Several researchers have specified that although technical skills are still considered as implicit in the skills base of a person entering an accounting career, accounting and business students must develop more than technical skills to succeed, and it is personal characteristics that enable career success. (Kavanagh & Drennan 2008, p. 281.)

Elliott and Jacobson (2002) assert that accountants need education in accompanying bodies of knowledge, such as organizational behaviour, issues in strategic management, measurement and analytical skills. In addition, Mathews (2004) proposes an interdisciplinary curriculum at university. Others suppose that university educators of future professional accountants should be committed to developing the relevant attributes identified as desirable for the accounting professional practice. Howieson (2003) sees the focus of the future accounting professional being the management of knowledge and adapting the education of

accounting professionals to capitalize on that. (Kavanagh & Drennan 2008, pp. 281-282.)

These views are supported by de la Harpe, Radloff, and Wyber (1999), who advocate integrating professional skills across disciplines. In accordance with Laurillard (1984) as well as Boud and Feletti (1991) the question whether it is better to develop these skills within the classroom or within the context of coming to know the discipline is the focus of much discussion. (Kavanagh & Drennan 2008.)

Globally, professional reports express concern that accounting education over-emphasizes the technical skills of graduates to the detriment of other competencies, and suggest the need for alternative instructional strategies, such as case-based methods, seminars, role-plays, and simulations to engage students in the learning process and develop skills such as creative and critical thinking. Many researchers have recommended leaving a wholly procedural (technical) approach to financial accounting. Hunton (2002) states that many traditional accounting tasks can be reliably automated, supporting claims that an accountant's worth is now increasingly reflected in higher-order skills, such as critical-thinking, problem-solving and analytical skills. (Kavanagh & Drennan 2008.)

In contrast, Cranmer (2006) and Clanchy and Ballard (1995) suppose that some feel that it is unrealistic for universities to attempt to guarantee that graduates will possess the necessary generic skills to meet the demands of employers especially across a range of disciplines. However, Albrecht and Sack (2000) stress the importance of skill development during accounting programmes and state that students forget what they memorize. Content knowledge becomes dated and is often not transferable across different types of jobs. On the other hand, critical skills rarely become outdated and are usually applicable across assignments and careers. (Kavanagh & Drennan 2008, p. 282.)

1.3 Research problem and objective

The aim of this research is to investigate written scientific articles about digital accounting from the pedagogical perspective in scientific journals during a time frame 2000-2017. This time frame was selected because since the beginning of the 21st century the topic has become the most actual and most of the articles have been written exactly in this period. Research questions aim to concentrate on and widen the research problem, they are presented in Table 1.1. Research questions are clustered into three groups, external and internal attributes of articles and future research areas. This table also presents research methods that are applied to discover answers to the research questions.

The research questions of the external attributes are included to find out if publication of articles has a focus on certain years, researchers, journals or institutions. Moreover, if possible also reasons for this are discussed. The third question is to discover the most important publication about the area of research. The fourth and fifth research questions concentrate on recent research about digital accounting linked with pedagogical view, analyzed data and applied methods in these studies. The answer to the third question leads to the answer of the question six. The sixth question is one of the most important because it could inspire future research about the topic. For this purpose content analysis will be applied to extract manually the perspective directions of the study from the text.

Table 1.1. Research questions and methods

Research question	Research methods
External attributes of the articles	
1. How are articles placed in time?	Analysis of publications per year
2. Has the research concentrated on specific researchers, journals or institutions?	Analysis of authors of the selected articles, analysis of affiliations and journals of the selected articles
Internal attributes of the articles	
3. What are the most important (the most cited or otherwise high quality) articles about the topic?	Citation count analysis of the selected articles

4. What has been studied about digital accounting from the pedagogical perspective?	Content analysis of the research aims of the selected articles
5. What research methods and data have been used?	Content analysis of the methods and data of the selected articles
Future research areas	
6. What areas could be interesting for future research?	Content analysis

1.4 Research methodology

To address the objective of the research we are going to apply bibliometrics as a research method.

Based on Archambault and Gagné (2004) bibliometrics and scientometrics are a set of methods for measuring the production and dissemination of scientific knowledge. Glanzel states that the terms bibliometrics and scientometrics were almost simultaneously introduced by Pritchard and by Nalimov and Mulchenko in 1969. They were developed for the purpose of providing research tools to historians and sociologists of science (Archambault & Gagné 2004). Glanzel (2003) provides that one of the first definitions of bibliometrics was the application of those quantitative methods which are dealing with the analysis of science viewed as an information process.

Leeuwen (2004) highlights two bibliometric approaches - descriptive and evaluative. In accordance with McBurney and Novak (2002) the descriptive method comprises evaluation of how many articles the author or organization has published and other statistical calculations which can be useful for doing some comparisons. An evaluative approach uses the citation analysis to assess how articles influence subsequent research by other scientists by determining how often they are cited. (Mcburney & Novak 2002). In accordance with Leeuwen (2004) evaluative bibliometrics is the application of bibliometrics which focuses particularly on the evaluation of scientific activity, and more, in particular, on the quality aspects of scientific performance. Rehn et al (2014) add that these aspects can be

considered as the article's impact on the scientific community which is measured by the number of citations. For the purpose of this research both approaches will be applied.

In bibliometrics scientific literature various groups of indicators are highlighted. In accordance with Durieux and Gevenois (2010) quantity indicators measure the productivity of certain researcher or research group, performance indicators evaluate quality of journal, researcher, or research group, and structural indicators determine connections in the research field. In the framework of this research quantity indicators are publication counts per journal and author. Citation counts refer to the performance indicator. A structural indicator is the number of publications per university and country. There are also other indicators in the study which are disclosed further.

For author, journal or set of scientific papers the evaluation H-index can be applied which was proposed by Jorge Hirsch in 2005 (Hirsch 2010). Hirsch (2010) Durieux and Gevenois (2010) state that the H-index provides one number that reflects the scientific impact of individual researchers – the higher the H-index, the better the researcher. The H-index is based on the scientist's set of most cited publications and number of citations they have received (Braun, Glänzel & Schubert 2006). For instance, a scholar has the H-index 15 if he has 15 publications and each of them has been cited at least 15 times. Braun et al. suggest that such index would be a useful addition to journal impact factors. The H-index is applied in this research.

Scopus CiteScore is another indicator which is applied for journal evaluation. Thus, CiteScore 2016 counts the citations received in 2016 to documents published in 2013, 2014 or 2015, and divides this by the number of documents published in 2013, 2014 and 2015 (Scopus 2017). The 3-year CiteScore time window was chosen by Sciverse Scopus as the best fit for all subject areas as a 3-year publication window is long enough to capture the citation peak of the majority of disciplines (Scopus 2017).

Scopus also offers SJR (SCimago Journal Rank) and SNIP (Source Normalized Impact per Paper) indicators for journal assessment. SNIP was introduced by Henk Moed in 2010 and evaluates the citation impact of scientific journals (Waltman, van Eck, van Leeuwen & Visser 2013). In accordance with CWTS Journal Indicators (2017) it is calculated as:

$$\frac{\text{number of citations given in the present year to publications in the past 3 years}}{\text{total number of publications in the past three years}} \quad (1)$$

SCImago Journal Rank, which is also named a prestige measure, is used for the assessment of the quality of scientific journals, applying the PageRank algorithm on the Scopus database (Falagas, Kouranos, Arencibia-Jorge & Karageorgopoulos 2008). Based on Falagas et al. (2008) the SJR indicator of a specific journal for a three calendar year period is calculated through an iteration process that computes the "prestige" gained by the journal through the transfer of prestige from all the other journals included in the network of journals, by their citations during the past 3 years to all articles of the specific journal published in the past 3 years, divided by the total number of the articles of the specific journal during the 3-year-period in regard. A journal with higher SJR is considered as more prestigious.

For the purpose of the Master's thesis, a set of articles is determined. The procedure of gathering articles for the bibliometric analysis includes database selection, data queries and manual evaluation. Sciverse Scopus was chosen as the primal database for this bibliometric study. The number of articles was defined based on the search results in the Sciverse Scopus database. Then manual classification of the articles was conducted. The final set of 46 articles was determined for further analysis (Appendix 1). Taking into consideration the novelty of the topic the author supposes that the sample is representative.

For data analysis, statistical analysis and visualization Sciverse Scopus and MS Excel 2016 are used within the research. The author has access to these software programs, thus no additional license is needed.

The reliability of the research is achieved by the precise description of the data collection process in such a way that the operations can be repeated with the same results. The internal validity of the findings is secured by the well-designed representation formats (figures, tables, etc.), their uniformity in one study, examining all the variables in which the effect may occur. The external validity is achieved by using an acceptable large sample of articles.

1.5 Limitations

The present research is an examination of articles published in scientific journals which are comprised by the selected databases. These articles have passed through a peer-review process which may guarantee acceptable level of quality. The databases also comprise conference papers, conference reviews, books, editorial material, notes, letters etc. but these documents were ignored during the data gathering.

This research is generally limited to articles that deal with the two aspects of the "digital accounting linked with pedagogical view" topic - contribution to curriculum of accounting disciplines and methods of teaching for higher engagement and better results of accounting specialists. Specific narrow research topics related to digital accounting from the business perspective were not selected for this study. They could be a material for future research.

Initially the limitation of articles had been determined by searching results of the selected databases, ISI Web of Science and Sciverse Scopus, at the stage of the preliminary analysis in the framework of this research. However, data gathering and article selection showed that most of the articles from Web of Science are duplicated in Scopus. In general, similar conclusions were made by scholars (Aghaei Chadegani, Salehi, Yunus, Farhadi, Fooladi, Farhadi, & Ale Ebrahim 2013), and the coverage comparison of Web of Science and Scopus is presented in the figure below.

Sciverse Scopus has a larger dataset, more than 69 million records (Scopus 2017), so more articles, journals and conference papers have metrics (University of Southampton library blog 2017) and 80% of the records include abstracts (Aghaei Chadegani et al. 2013), which is more valuable for the bibliometric study.

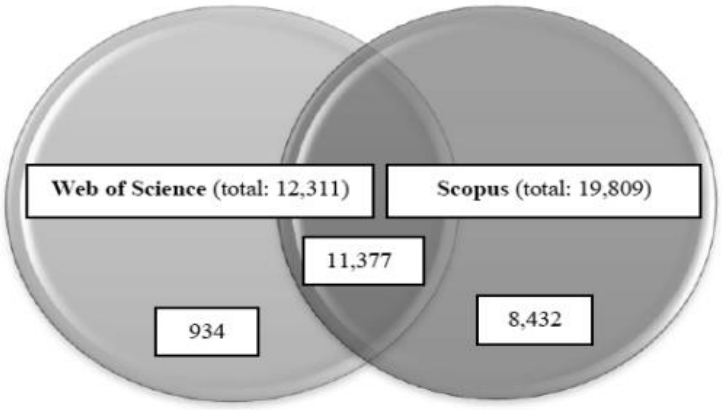

Figure 1.1. Coverage comparison of Web of Science and Scopus (Aghaei Chadegani et al. 2013)

In the framework of this research the decision was made to neglect minor unique results of the Web of Science database and use only articles from the Sciverse Scopus for the analysis. Articles from Web of Science are rather new and have no citations, so it should not affect the research results significantly. Moreover, the limitation regarding using only the Scopus database allows to apply tools for analysis integrated to the Scopus, at least partly, which decreases the probability of error during the bibliometric analysis and calculations. These states are supported both by Saukko (2014) and Lukkari (2011) who came to the conclusion that Scopus could be used as the only database for bibliometric studies and still provide comprehensive results.

Only articles with an abstract or a full text available were included in the study. Chapter 3.1.1. describes the selection of databases and the article selection is explained in chapter 3.1.2. For some articles a full text was not available so the content analysis was based only on abstracts and thus could be questionable.

The time frame was selected before the study and it is 2000–2017 to evaluate recent trends of the 21st century in the research area, especially taking into account the fact that most of the publications were done during this period as the topic of the study is rather new. Since the data gathering was completed in September 2017, articles published later are missing from this study.

1.6 Structure of the study

Table 1.2 reveals the structure of the research as inputs and outputs of chapters. Chapter 1 presents background and reasons for this study and describes research problem, research questions, research methodology and limitations. Chapter 2 comprises the theoretical framework of the research topic and exposes main concepts from recent scientific literature. Chapter 3.1 explains the database and article selection as well as the article categorization process. Chapter 3.2 discloses years, authors, journals, citation analysis of the chosen articles and also their content analysis. Chapter 3.3 evaluates reliability and validity of the research. Chapter 4 contains the results of the study and answers to the research questions as well as a brief summary of the research.

Table 1.2. Structure of the study

Chapter	Input	Output
1 Introduction	Background and reasons	Research objective, questions, methodology, limitations
2 Theoretical framework	Literature	Definition and theory findings about the main concepts of the research
3.1 Selection of data	Data retrieval	Explanation of database and article selection process
3.2 Descriptive Analysis	Selected articles	Results of content, years, authors, journals, citation analysis of the selected articles
3.3 Reliability and validity of the study	Problem areas of the study in reliability and validity	Evaluation of reliability and validity of used methods
4 Discussion and conclusions	Previous results	Answers to the research questions

2 Theoretical framework

This chapter contains theoretical findings related to the research topic and exposes main concepts of the research area from recent scientific literature. First, accounting and digitalization concepts are described in the chapter. The synthesis of these terms leads to the next concept of the study – digital accounting. The concept of pedagogy is built on the classic theoretical point of view and it includes modern methods and trends in accounting education.

2.1 Accounting

Vickerstaff and Parminder define accounting as the process of recording, summarizing, communicating and analyzing the financial transactions of a business (Vickerstaff & Parminder 2012).

The various definitions and explanations of accounting have been propounded by different accounting experts from time to time and the following aspects comprise the nature of accounting (Mahesh 2017).

1) Accounting is a service activity and its function is to provide quantitative information, primarily financial in nature, about economic entities, that is intended to be useful in making economic decisions, in making reasoned choices among alternative courses of action. It means that accounting collects financial information for various users for making decisions and tackling business issues. Accounting in itself cannot create wealth though, if it produces information which is useful to others, it may assist in wealth creation and maintenance. (Mahesh 2017.)

2) Accounting as a profession. A profession is a career that involve the acquiring of a specialized formal education before rendering any service. Accounting is a systematized body of knowledge developed with the progress of trade and business over the past century. The accounting education is being imparted to the examinees by nationally and internationally recognized bodies like American Institute of Certified Public Accountants (AICPA), Association of Chartered Certified Accountants (ACCA), Chartered Professional Accountants (CPA), etc.

The candidate must pass a vigorous examination in accounting theory, accounting practice, auditing and business law. The members of the professional bodies usually have their own associations or organizations, in which they are required to be enrolled compulsorily as Associate member of the Institute of Chartered Accountants (A.C.A.) and Fellow of the Institute of Chartered Accountants (F.C.A.). In a way, accountancy as a profession has attained the stature comparable with that of law, medicine or architecture. (Mahesh 2017.)

3) Accounting as a social force. In early days, accounting was only to serve the interest of the owners. Under the changing business environment, the discipline of accounting and the accountant both have to watch and protect the interests of other people who are directly or indirectly linked with the operation of modern business. The society is composed of people as customer, shareholders, creditors and investors. The accounting data is to be used to solve the problems of the public at large such as determination and controlling of prices. Therefore, safeguarding of public interest can better be facilitated with the help of proper, adequate and reliable accounting information and as a result of it society at large is benefited. (Mahesh 2017.)

4) Accounting is rightly referred the "language of business". It is one means of reporting and communicating information about a business. As one has to learn a new language to converse and communicate, so also accounting is to be learned and practiced to communicate business events. A language and accounting have common features as regards rules and symbols. Both are based and propounded on fundamental rules and symbols. In language these are known as grammatical rules and in accounting, these are termed as accounting rules. The expression, exhibition and presentation of accounting data such as a numerals and words and debit and credit are accepted as symbols which are unique to the discipline of accounting. (Mahesh 2017.)

5) Accounting as science or art. Science is a systematized body of knowledge. It establishes a relationship of cause and effect in the various related phenomenon. It is also based on some fundamental principles. Accounting has its own principles

e.g. the double entry system, which explains that every transaction has a two-fold aspect i.e. debit and credit. It also lays down rules of journalizing. So, we can say that accounting is a science. Art requires a perfect knowledge, interest and experience to do a work efficiently. Art also teaches how to do a work in the best possible way by making the best use of the available resources. Accounting is an art as it also requires knowledge, interest and experience to maintain the books of accounts in a systematic manner. Everybody cannot become a good accountant. (Mahesh 2017.)

6) Accounting as an information system. Accounting discipline will be the most useful one in the acquisition of all the business knowledge in the near future. People will be constantly exposed to accounting information in their everyday life. Accounting information serves both profit-seeking business and non-profit organizations. The accounting system of a profit-seeking organization is an information system designed to provide relevant financial information on the resources of a business and the effect of their use. Information is relevant and valuable if the decision makers can use it to evaluate the financial consequences of various alternatives. Accounting generally does not generate the basic information (raw financial data), rather the raw financial data result from the day to day transactions of the business. As an information system, accounting links an information source or transmitter (generally the accountant), a channel of communication (generally the financial statements) and a set of receivers (external users). (Mahesh 2017.)

2.2 Digitalization

‘Digitization’ and ‘digitalization’ are two conceptual terms that are closely associated and often used interchangeably in a broad range of literatures. The Oxford English Dictionary (OED) traces the first uses of the terms ‘digitization’ and ‘digitalization’ in conjunction with computers to the mid-1950s. In the OED, digitization refers to “the action or process of digitizing; the conversion of analogue data (esp. in later use images, video, and text) into digital form.” Digitalization, by contrast, refers to “the adoption or increase in use of digital or computer technology

by an organization, industry, country, etc.” (Brennen & Kreiss, 2014.) As digitization capabilities extend, virtually every aspect of life is captured and stored in some digital form, and we move closer towards the networked interconnection of everyday objects. The impact of this is a real-time global exchange of information between multiple connected devices (fixed and mobile). (Ernst & Young 2011.)

In the book “Digital Futures: Strategies for the Information Age”, Deegan and Tanner (2002) dedicate the whole chapter to the question of ‘‘Why digitize?’’. Among the benefits cited are the potential to display information from inaccessible formats, such as large-scale maps; the ability to enhance digital images; improved searchability (e.g., full-text); ‘‘virtual reunification’’ of dispersed collections; and the potential for integration of digitized resources into teaching materials. These functionalities can be especially important in an academic environment. (Perry 2005.)

In business context digitalization means the use of digital technologies and of data (digitized and natively digital) in order to create revenue, improve business, replace/transform business processes and create an environment for digital business, whereby digital information is at the core (i-Scoop 2017).

BarNir, Gallaugher and Auger (2003) suppose that digitization of business processes is one of the factors that contribute to the execution of strategic efforts aimed at achieving innovativeness and low costs. Being that digitization involves both the incorporation of new technology into the organization and the integration of this new technology with existing processes, it may be viewed as both a product and a process and may be a driving strategy as well as driven by it. (BarNir et al. 2003.)

Gartner Inc., the world's leading research and advisory company, identifies digitalization as the road of moving towards digital business and digital transformation, as well as the creation of digital revenue streams and offerings while doing so (Krigsman 2014). Gartner calls the digitalization of business a "third era of enterprise IT," following a period in which IT strived to standardize processes

and deliver services efficiently (Krigsman 2014). The following diagram illustrates the progression toward a world in which IT innovation supersedes efficiency as the primary metric (Figure 2.1).

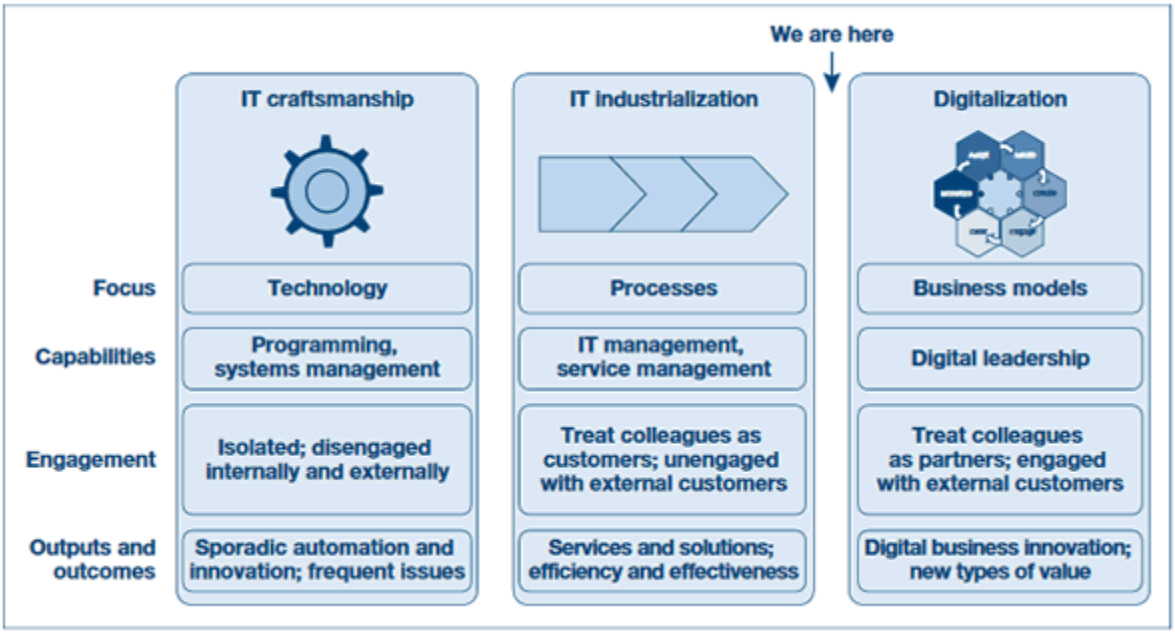

Figure 2.1. Digitalization according to Gartner (Gartner 2014)

The third era of IT is about moving from a view of the business as a customer that has its own external customers, to viewing the business as a partner, working together to serve the external customers of the larger business. In the old model, IT was insulated from market changes by a layer of abstraction in the form of the business unit. The business unit was responding to changes in the market, which usually did not require rapid changes to IT. (Jones 2014.)

But now, market changes are being driven by rapid digitalization. Consequently, it's not possible for the business unit to respond to those market changes without involving IT. With the consumerization of IT, if IT continues to respond at their usual "second era" pace, the business unit has no choice but to look for outside technology suppliers that are more agile. (Jones 2014.)

2.3 Digital Accounting

The term digital refers to digits or numbers; however, in the computer science lexicon this term refers to the representation of information in 0s and 1s, which can be read, written and stored using machines. The prefix “e” refers to electronic, meaning use of electricity in powering machines such as computers. Digital accounting, or e-accounting, as a corresponding analog, refers to the representation of accounting information in the digital format, which then can be electronically manipulated and transmitted. Digital accounting does not have a standard definition but merely refers to the changes in accounting due to computing and networking technologies. (Deshmukh 2006, p. 1.)

Accounting, the art and science of measuring business performance, has evolved with business, more so with information technology. Punch cards and mainframes, databases and data warehouses, personal computers and productivity software, specialized accounting software and Enterprise Resource Planning (ERP) systems, Local Area Networks (LANs) and Wide Area Networks (WANs), among other things, have left their mark on accounting theory and practice. For example, data-entry mechanisms, data storage and processing mechanisms, end reports, internal controls, audit trails and skill sets for accountants have been in continual flux for the past several decades. (Deshmukh 2006.)

In the late 1950s and early 1960s, the mega corporations of the day began to handle data that rivaled government requirements. This data could not be handled manually, let alone cost effectively. Accounting and financial information, due to its repetitive nature and heavy volume, became a prime candidate for automation. Initial investments in information technology, though the term was not yet invented, were controlled by accounting and finance departments. The mechanization of accounting and finance information expanded the power of Chief Financial Officers (CFOs) and controllers by enabling them to influence operational and strategic decisions. The financial justification of investments was not an issue, since financial executives endorsed the investments. However, as the tabulating installations turned into data processing centers, the technology became too

complex to be controlled by accountants. Data processing managers started handling the data processing center and the Data Processing Management Association (DPMA) was born. The automation of accounting and financial data had begun, and soon developed an irreversible momentum. (Deshmukh 2006.)

Accounting and e-commerce also met decades ago. The development of Electronic Data Interchange (EDI) and Electronic Fund Transfer (EFT) can be said to be the beginnings of the digital exchange of accounting information among trading partners (Deshmukh 2006).

The advent of the Internet and e-commerce/e-business has continued and in many ways accelerated the trend. The Internet and e-commerce not only promised to change intra and inter-business processes but also challenged the very foundations of established business practices (Figure 2.2). The use of the Internet by businesses gave rise to e-commerce. The complexity of this area is characterized by multiple definitions, a profusion of jargon and diversity of opinions. Academics and practitioners have defined e-commerce, e-business, e-tailing and i-commerce; different types of e-commerce such as Business-to-Consumer (B2C) and Business-to-Business (B2B); online vs. off-line business models; and so on. E-commerce alone has several definitions. (Deshmukh 2006, p. 3.)

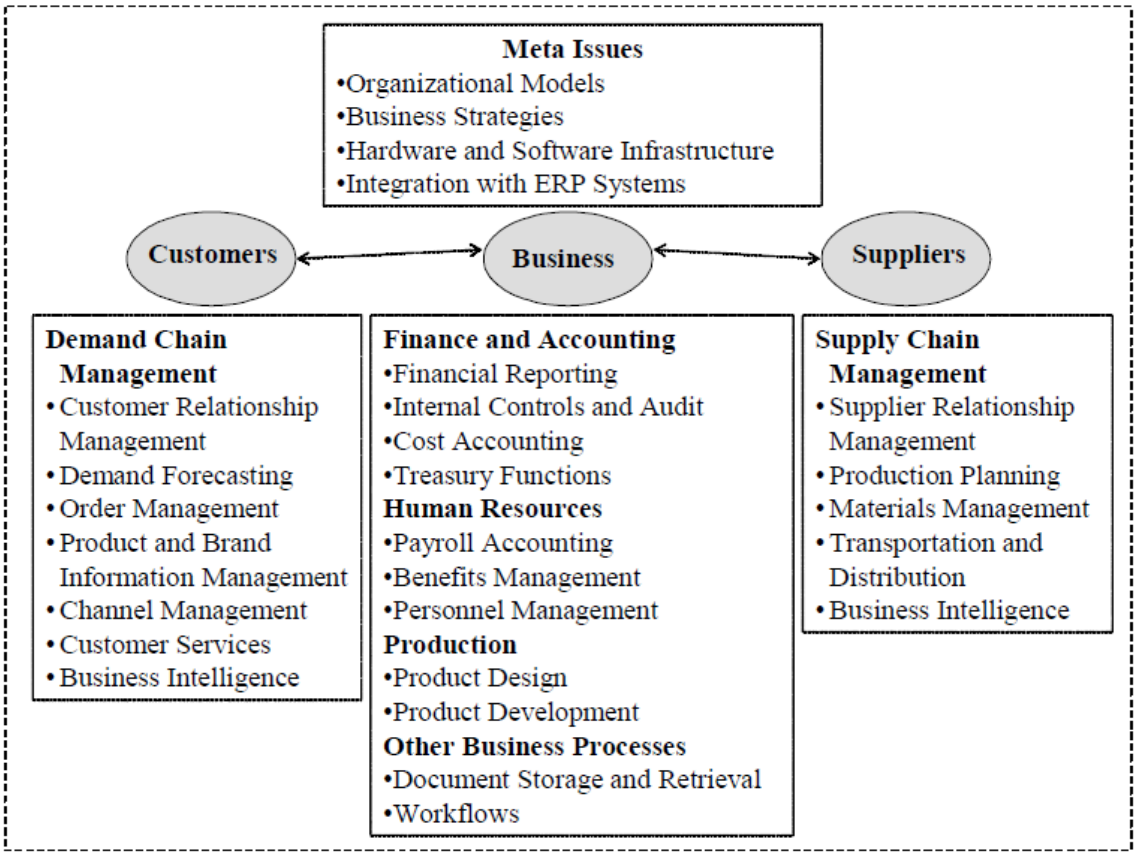

Figure 2.2. The effects of the Internet and e-commerce on business (Deshmukh 2006)

The Internet also transformed internal business processes. For example, purchasing departments can employ online auctions in real time to reduce costs, employees can use e-procurement software to order supplies from their desktops, customers can configure products online, engineers can collaborate on product development across the world, travel and operating expenses can be managed online and goods in transit can be monitored over the Internet. (Deshmukh 2006, p. 8.)

The effects of the Internet on accounting are described via different terms in the literature; for example, financial electronic commerce, e-finance and e-accounting. There has been one conference, the Financial Electronic Commerce Conference, and the presentations in the conference did not explicitly define or describe the

term. However, the subject matter presented in the conference mainly dealt with accounting and finance. The term e-finance industry does appear in the literature. This term refers to major traditional finance industries such as banking, brokerage and insurance that have become net centric. On the other hand, the e-finance term has also been used to delineate changes in the accounting/finance functions due to the Internet. This terminological confusion is very common in the e-commerce arena. The effects on accounting due to the Internet, shorn of technical jargon, can be described, on the lines of the description of the e-commerce term, as follows. (Deshmukh 2006.)

• Electronic networks or the Internet are used as a communications medium for the exchange of accounting and financial information;

• Accounting and finance functionality that supports capability to sell and deliver products or services on the Internet;

• Uses the networks and digital information to redesign accounting and finance processes and workflows.

Developments in computers and networks have now affected virtually every area in accounting. Take revenue cycle, for example. Sales orders can arrive on the Web through EDI, B2B or B2C storefronts, Customer Relationship Management software or automated sales force. In cases of sales orders that need credit decisions in a few minutes, Web-based credit services offer automation of the entire credit approval process. Web-enabled Warehouse Management Systems (WMSs) partially or completely automate picking and packing of goods and products. Shipments can be tracked or monitored using the Internet. The billing function can be handled as Electronic Bill Presentment and Payment (EBPP) or e-billing and/or by FEDI. Online receivable services can automate the entire receivables process. Payments can be made using credit cards, procurement cards, electronic checks or digital cash in addition to traditional methods. New software tools and accounting processes have emerged to implement and handle these changes. (Deshmukh 2006, p. 10.)

A general listing of costs and benefits is easy. However, quantification with a reasonable degree of accuracy is difficult. The costs are quite readily apparent and can be quantified to a certain extent.

Deshmukh takes a conceptual look on pros and cons of software tools and accounting digitalization (Table 2.1).

Table 2.1. Benefits and costs of digital accounting (adopted from Deshmukh 2006)

Benefits	Costs
1. Faster cycle times — these include credit approvals, payments and collections, posting of transactions, closing of the books, generation of reports and more time available for higher-level analysis	1. Investments required in computer hardware and software
2. Broader geographic reach	2. Initial need for expensive consultants
3. Continuous service availability, 24/7 access, and more satisfied internal and external customers	3. Costs involved in systems, processes, processing of information and report generation changes
4. Reduced error rates – that means fewer transactions with errors as well as fewer errors	4. Continual training or retraining needs and/or requirements for personnel with specialized skills
5. Reduced accounting staff and improved productivity	5. User resistance
6. Better cash management – efficient payments and effective collections	6. Careful attention needs to be paid to security, control and audit requirements for financial transactions during the initial configuration. If the initial configuration of the system is not correct or the integration with ERP software or legacy systems is faulty, then there are recurring costs and fewer benefits from the

	implementation.
7. Cost savings in mail, paper and storage of paper	
8. Improved audit trails and security.	

The costs and benefits of digital accounting decisions are intimately linked with targeted accounting processes, the information technology used and the knowledge needs for the proposed solution; as such, each decision is unique. (Deshmukh 2006.)

The accounting profession has responded to the digital revolution quite admirably by continuing to refine and develop accounting standards, procedures, and services appropriate to the new global, technology-centric business world. Simultaneously, the profession should turn to accounting researchers for further guidance in this regard, as the survival instinct of professionals (quite understandably) is to react to environmental changes while academics are supposed to take a complementary proactive stance that can help the profession survive and prosper in the long-run. (Hunton 2012.)

The accounting profession worldwide has come under close scrutiny in the last decade as a result of a series of high-profile corporate failures, changing technology and globalization of the world economy. These change drivers have reduced the cost of information and increased the level of competition among organizations. Albrecht and Sack (2000) state this has resulted in a need for quicker and more decisive action by management, an emergence of new companies or industries and a requirement for new professional services and skills. (Kavanagh & Drennan 2008, pp. 279-280.)

As a result, according to Birrell (2006) employers are seeking a diverse range of skills and attributes in new accounting graduates to maintain a competitive advantage despite the fact that many countries are facing a skills shortage in the area. Recently, the training and education of accountants worldwide has been the

subject of much debate and political struggle. While capitalizing on traditional strengths, such as independence and concern for public interest, expectations of performance placed on accounting graduates are complex and demanding, requiring them to develop broader skills and be committed to continuing professional development and lifelong learning. (Kavanagh & Drennan 2008.)

Practitioners believe that skills and abilities are as important as knowledge. It may be worthwhile for management accounting academics to include practitioners in the development of their courses and use a wider range of teaching and assessment techniques that specifically develop students' skills such as writing business reports, and making computer presentations. (Botes & Sharma 2017.)

2.4 Pedagogy

As one of the actual topics in digital accounting is preparing accounting specialists with skills and knowledge matched with market requirements it is necessary to reveal some terms from the field of education.

Thus, one of the basic concept is pedagogy - the study and theory of the methods and principles of teaching (Collins English Dictionary 2017). Pedagogy itself is a contested term, but involves activities that evoke changes in the learner: Watkins and Mortimore define pedagogy as any conscious activity by one person designed to enhance learning in another. According to Bernstein (2000), pedagogy is a sustained process whereby somebody(s) acquires new forms or develops existing forms of conduct, knowledge, practice and criteria from somebody(s) or something deemed to be an appropriate provider and evaluator. Bernstein (1990) contrasts two models of pedagogy that focus on the teacher's organization, management, discourse and response to the students and which provide a useful theoretical framework with which to understand different pedagogic approaches (Westbrook 2013):

- Performance model: visible pedagogies where the teacher explicitly spells out to the students what and how they are to learn, with a recognizable

strong framing or lesson structure, collective ways of behaving and standardized outcomes;

- Competence model: invisible pedagogies with weaker framing that result in an ostensibly more informal approach where the teacher responds to individual students' needs, with hidden or unfocused learning outcomes. (Westbrook 2013.)

Westbrook found Alexander's definition of pedagogy most helpful, wherein teaching is an act while pedagogy is both act and discourse. Pedagogy comprises teachers' ideas, beliefs, attitudes, knowledge and understanding about the curriculum, the teaching and learning process and their students, and which impact on their teaching practices, that is, what teachers actually think, do and say in the classroom. Teacher beliefs are contextually based, and Alexander's definition also encompasses social, cultural and political aspects. (Westbrook 2013, p. 7.)

The reinvention of pedagogy as a science was symbolized by establishing the first Chair for Education in 1779 at the University of Halle. The first professor, Ernst Christian Trapp (1977), emphasized in his inaugural lecture the necessity of the development of a scientific pedagogy. Whereas based on Herbart (1964) pedagogy as a science consists of a set of interconnected, preferably justified assumptions, pedagogy as practice is a techne´, a set of abilities to achieve certain purposes. (Kenklies 2012.)

Westbrook supposes that many of the terms and categories used to describe pedagogical theory and practice are contested and subject to multiple interpretations and uses. However, he examines the theories of learning that underpin the different pedagogical approaches and explains some of the assumptions implicit within them. (Westbrook 2013.)

Behaviorism emerged as a theory of learning from the work of Thorndike (1911), Pavlov (1927) and Skinner (1957), becoming dominant in the 1960s and 1970s; these the scientifically proved laws of stimulus-response and classical and operant conditioning were used to explain the learning process through the use of rewards

and sanctions – or trial and error. This was seen as biologically driven, a form of adaptation to the environment. The learner is rewarded for small steps of learning and achievement with consistent positive reinforcement. The behaviorist model was later challenged by social learning theory, where children were seen to learn via observation by Bandura (1977) or imitation side by side with adults in an apprenticeship model. (Westbrook 2013.)

Broadly speaking, behaviorism supports teacher-controlled or -centered approaches where the teacher is the sole authority figure. Knowledge is parceled out from different parts of a separated curriculum that students experience as distinct subjects, and directed from the teacher to the students in set sequences, with little student choice or interaction. Assessment is often exam-oriented and high stake, without teachers' direct involvement. Drawing on Bernstein, such performance pedagogies would be highly visible to the learner, strongly framed and paced by the teacher, with subjects strongly classified. Pedagogic approaches that can broadly be described as behavioristic in origin may result in practices such as lecturing, demonstration, rote learning, memorization, choral repetition, imitation/copying or master-classes (e.g. learning music or dance). Structured or direct/explicit instruction as a practice differs in being teacher-led rather than teacher-centered, and indicates that teachers follow a particular sequence, often scripted and even prescriptive, as in the teaching of early reading, but this may develop into more student-centered activities at a later stage of the lesson. Behaviorism could be held to be universal as a theory, applicable within a variety of contexts, both cost- and time-efficient and require fewer resources, including demanding less-qualified and -skilled teachers. Critiques of behaviorism lie in the surface-nature of the knowledge acquired and the way in which the one-size-fits-all approach excludes students with individual differences, or where the teacher remains unaware of students' current knowledge or misconceptions. (Westbrook 2013.)

Based especially on the work of Piaget (1896-1980), **constructivism** differs from behaviorism in theorizing the mind as inherently structured to develop concepts

and acquire language. Individual learners actively explore their environment by building on their existing cognitive structures or schemas. When these schemas are adequate to deal with a new object, situation or problem, learning occurs through a process of assimilation. When an existing schema is not adequate to deal with a new object, situation or problem, a process of accommodation is required whereby learners modify their existing schema. Constructivist approaches see that activities are provided to build on students' current knowledge and match their appropriate developmental stage, and challenge them so that through the process of accommodation, they continue to make progress. Individual and group work centered around problem solving and project work is appropriate. Concrete activities are privileged for younger children, activities involving symbolic and abstract thought reserved for older students. (Westbrook 2013.)

In student-centered education, as developed by Locke, Rousseau and Froebel from the late 1600s onwards, pleasure, interest and playfulness are seen as central to the pupil within an integrated curriculum in which the student commune freely with nature and have some agency over their own learning. This approach to pupils' education has influenced practitioners in Europe, Russia and America. In England, the Plowden Report of the 1960s advocated child-centered pedagogy for primary schools, and it remained a dominant and idealized form of pedagogy labelled as progressive until the 1980s. This is Bernstein's competence model: invisible pedagogic practices with less direction or instruction of the whole class by the teacher, greater individualization, weaker classification and framing, with a slower pace and hidden or disguised learning outcomes. Student-centered learning pedagogies can be theorized as influenced by constructivism, and can be seen in experiential learning, learning in outdoor contexts such as Forest Schools in Denmark, and Activity-Based Learning. (Westbrook 2013.)

Critiques of student-centered education would suggest that it is context-specific rather than universal, and possibly elitist in its outcomes. Critics such as Bernstein and Bourdieu and post-structuralists such as Foucault considered student-centered education to be a covert form of social control, disempowering the working-class

background student and those from ethnic minorities and pathologizing them to promote the hegemony of the middle class. (Westbrook 2013.)

Social constructivism sees knowledge as socially constructed and learning as essentially a social process. It is mediated through cultural tools, above all by language, which needs to be the learner's first language or at least one very familiar to them, and facilitated by drawing on examples or contexts familiar to the learners so that meaning making is prioritized. Vygotsky (1986) claims that teachers apply this model by setting up a Zone of Proximal Development (ZPD), that is, an area of activity where, with the aid of a teacher or more knowledgeable peers, students are able to do what they cannot achieve alone. Learning involves students gradually adopting this social activity with higher order cognitive development or thinking directly developed and structured by their external social speech. According to Vygotsky (1986) students' natural or spontaneous concepts meet with and are further developed by the scientific or more abstract concepts they are taught through guided instruction. Wood, Bruner and Ross (1976) suppose that such scaffolding or guided support requires a skillful mix of teacher demonstration, praise, minimization of error, practice and direct instruction. Pedagogic practices consistent with social constructivist approaches prioritize student-teacher or student-student interaction. Small-group, pair and whole-class interactive work, extended dialogue with individuals, higher order questioning, teacher modelling, showing, reciprocal teaching and co-operative learning can all be seen as justified by social constructivism. To this extent, social constructivism could be seen as supporting student-centered pedagogy, although social constructivism would suggest a much stronger role for the teacher than would be suggested by student. Assumptions around student-centered pedagogy are that teachers share their students' language and culture, accept a more democratic and less authoritative role, and know how to set up effective group work and tasks and to offer skillful supported instruction at the point it is needed. Furthermore, space is needed for flexible social groupings, and within this, students need to feel that they have the right to talk and contribute to their peers' learning. Inherent within this is a recognition of the student as a person with rights, taken on formally by UNESCO

within Child Friendly Schools, with its human rights-based approach to schools and pedagogy. (Westbrook 2013.)

Critical pedagogies, originating from Paulo Freire (1972) in Brazil, aim towards pursuing a fuller humanity, social emancipation and transformation. This is through a dialogic, reflective approach wherein the teacher is no longer authoritative but, as an intellectual, enables students to develop critical consciousness of their own oppression and to act on the world as they learn in order to change it. (Westbrook 2013.)

The table below summarizes the broad theoretical schools of thought underpinning different pedagogical approaches.

Table 2.2. Theoretical schools of thought and associated pedagogies (adopted from Westbrook 2013)

Broad theoretical school of thought	Associated pedagogy	Examples of pedagogies in developed countries
Behaviorism	Teacher-centered learning	Whole class teaching, working together as a collective
	Performance model, visible pedagogy	Focus on mastery of skills in a particular sequence
Constructivism	Child-centered learning	Project work;
	Competence model or invisible pedagogy	individual activity, experiential teaching
Social constructivism	Teacher-guided	Reciprocal teaching of reading
	Student-centered learning	Communicative learning
		Co-operative learning
		Group work element
Critical theory	Critical pedagogies	Critical pedagogies (such as Philosophy for Children in England)
		Student voice

Bonk and Smith concretize general models of teaching presented by Westbrook and stress two approaches to accounting education to satisfy needs of business – teacher-centered traditional approach and student-centered consultative approach. In the traditional college classroom, the instructor acts as the central authority with ready answers to all questions and problems. Traditional approach presents massive amounts of information, minimal time is allowed for discovering data relationships and possible inconsistencies. In comparison, a consultative approach strives to develop students' abilities for abstract thinking, problem definition, interpretation, and synthesis with less structured interdisciplinary problems. This open-ended teaching method forces students to accept responsibility for their own learning. Content is not ignored in a consultative style, but, instead, is selected and generated by learners. (Bonk & Smith 1998.)

De Wet and Van Niekerk (2001) define a student-centered approach as one of the trends in accounting education. All the trends highlighted by the scholars are presented in the Figure 2.3.

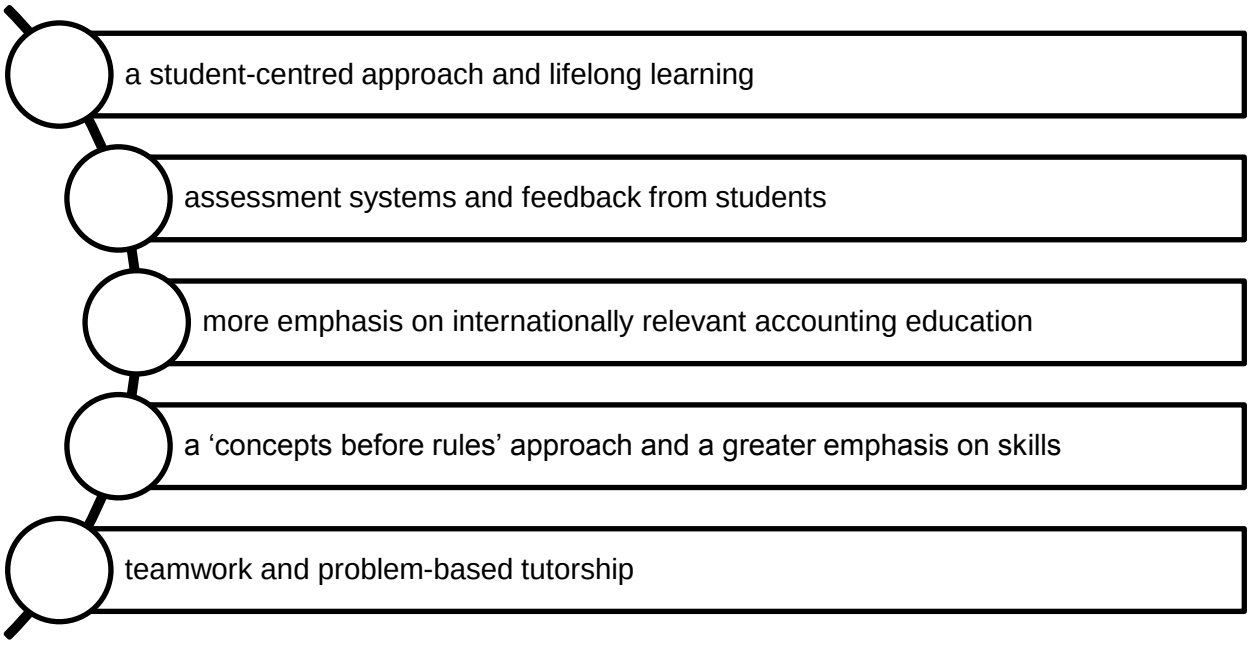

Figure 2.3. Trends in accounting education (adopted from De Wet & Van Niekerk 2001)

As per Dimitrios, Labros, Nikolaos, Maria & Athanasios (2013) the teaching of accounting has been done, mostly, by conventional (traditional) or slightly sophisticated teacher-centered methods rather than modern student-oriented applications and techniques while the transmission of knowledge and information has been realized with the usual form of lectures or discussions requiring physical presence of both student and the teacher.

Accounting academics have become increasingly concerned about the importance of supporting higher-order thinking skills in undergraduate education. This realization results from business and industry appeals for flexible and creative employees who can look beyond the numbers. (Bonk & Smith 1998.)

In accordance with Bonk and Smith pressures to cultivate skills demanded by a 21st century workplace justifies a consultative approach in the accounting curriculum. As consultative accounting applications are documented and refined, critical and creative thinking techniques will supply much needed fuel to the teaching and learning reform movement taking place across higher education settings. In the mean-time, if accounting instructors begin to experiment with the critical and creative thinking methodologies discussed in this paper, significant pedagogical progress should occur. Undoubtedly, some accounting educators are already exploring unique combinations of the instructional techniques presented here. At the same time, distance education is already multiplying the options for learner-centered pedagogy and associated critical and creative thinking experimentation. And when accounting classrooms become engulfed with the generative spark of creative thinking as well as the evaluative flame of critical thinking, exciting learner-centered instruction will burn brightly. (Bonk & Smith 1998.)

The variety of teaching methods for various approaches in education is presented in Figure 2.4.

Figure 2.4. Teaching methods and strategies (Poster4teachers 2017)

Dimitrios et al. (2013) categorize teaching methods for accounting courses in the following five groups:

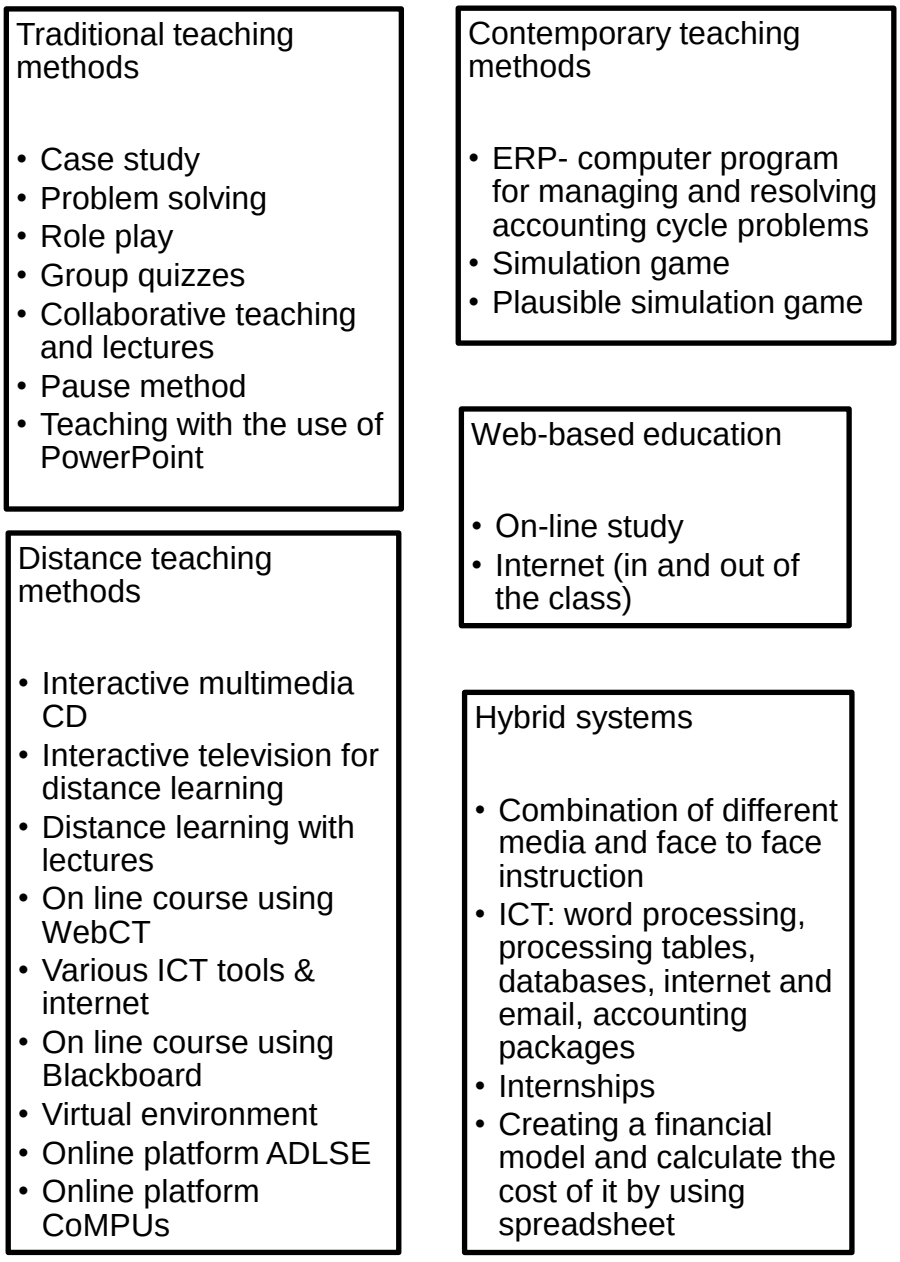

Figure 2.5. Teaching Methods for accounting courses (adopted from Dimitrios et al. 2013)

Traditional teaching methods including case studies, group quizzes, lectures and collaborative teaching, homework, use of blackboard and computer programs and other techniques like the pause method, allow student participation in lectures while providing them with the opportunity to select their own learning process. Modern teaching methods, on the other hand, including contemporary software

programs, distance-learning and hybrid teaching methods aim at the same end. (Dimitrios et al. 2013.)

Bonner (1999) notes however that students' background knowledge, academic performance and learning abilities need to be taken into consideration for the selection of the most suitable teaching method and combination of teaching applications. By implication, teaching curricula and academic goals should be formed according to the needs, demands and ambitions of a given student population and educational context in order to strengthen students' motives and ensure active participation in the learning process. (Dimitrios et al. 2013.)

The main methods of contemporary teaching include video watching and role playing, while students are encouraged to attend and participate in lectures via interactive whiteboards, too. Different functions of the virtual learning environment such as chat rooms and self-assessment encourage essential communication skills and interaction among members of the digital educational environment. (Dimitrios et al. 2013.)

In the field of accounting, a wide range of software programs could be applied, according to each academic subject's structure, goals and requirements. These programs may include quizzes, simulation games and multiple-choice questions, which provide feedback and promote students' analytical skills and self-monitoring abilities. (Dimitrios et al. 2013.)

Distance-learning programs in accounting may include interactive multimedia CDs containing case studies and tele-education via interactive television. Furthermore, distance-learning programs may provide virtual learning environment via the internet and interactive whiteboards, which have proven to be quite popular among students, although traditional teaching methods are still preferred by a great number of students in accordance with Dunbar (2004). Indeed, it should be mentioned in this context, that students have been found to prefer traditional teaching and learning that facilitates student interaction and student-teacher

interaction, despite that all students' exam performance in that particular study was satisfactory, irrespective of the learning method used. (Dimitrios et al. 2013.)

Another popular distance learning application, especially among male students, is teaching through the use of Information and Communication Technologies (ICT). Research however, in accordance with De Lange, Suwardy and Mavondo (2003), has also shown that students prefer ICT applications as a supplementary rather than the main teaching method. Wells, De Lange and Fieger (2008) suppose that a similar method is the online Tool Blackboard, also preferred among students as an auxiliary strategy, which – according to them should not completely replace traditional teaching. (Dimitrios et al. 2013.)

Hybrid teaching models include both traditional face-to-face interaction among students and teachers and alternative teaching methods. Dowling, Godfrey and Gyles (2003) find them to be quite popular, especially among female students. According to Bersky and Catanach (2005) such programs, which have been effectively applied in student populations are the Business Planning Model, which is based on case study simulations and the SCAM Accounting Program based on real company data. Other hybrid teaching models applicable in the real business world are "Creating Financial Models and Calculation of costs by using Spread-sheet" discussed by Beamen, Waldmann and Krueger (2005) and "Teaching Through the use of Low-Income Taxpayer Clinics" covered by Anderson and Bauman (2004) that seem to be useful as secondary learning tools. (Dimitrios et al. 2013.)

Carenys and Moya (2016) argue the recent years have seen increased interest in examining the relationship between the use of digital games and various types of learning outcomes. Routledge states that such method of understanding complex concepts as gamification is vital in education and business, "there is a whole generation of middle managers who have learned a lot from games". Routledge defines gamification as applying game mechanics to non-game activities with the intention of making these activities more engaging. Typical game mechanics

include levels, badges and achievements to build interest and maintain engagement. (Routledge 2015.)

A study in 2011 by Sitzmann (2011) also showed positive results of using games, showing improved post-training efficacy (20 percent), higher declarative knowledge (11 percent), improved procedural knowledge (14 percent) and better retention (9 percent) when compared to trainees using non-game-based learning methods.

Routledge points out the following types of games, which a presented in Table 2.3.

Table 2.3. Types of games (adopted from Routledge 2015)

Type	Definition
Serious Games	These take traditional game design methodologies combined with instructional design approaches to address behavior change in specific subjects. It is not necessary to use game technologies to create a Serious Game. Serious Games are often used to bring content to life through the use of stories, progression and challenges designed to gradually increase a user's awareness of a concept and guide them toward best-practice behavior.
Simulations	Simulations are a realistic representation of a working model of a system or process. Simulations are reliant on behavioral rules and are truer to life than Serious Games.
Virtual Worlds	These have the appearance of a game but do not leverage any of the game design mechanics around motivation and engagement that one would associate with a game. They are social places where people can gather in a visual space.
Mobile games	Typically falling into the casual games genre, mobile games are usually quick to pick up and play and simple to understand. Most consist of simple matching games or traditional card games. Some more complex games are

	coming onto the market but due to limitations of hardware and software the opportunities for complex games is still nascent.
Augmented reality	Applications that use cameras to superimpose a computer-generated image on a user's view of the real world.
Virtual reality	Computer-generated simulation of a 3D image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment.
MMORPGs	Massively Multiplayer Online Role Play Games are game worlds that can support large numbers of players simultaneously.

Thus, in this chapter the main concepts of the research were discussed from different facets, including accounting, digitalization, and pedagogy. In the Figure 2.6 we can see a Venn diagram, where the intersection of all these concepts is the area of the current study.

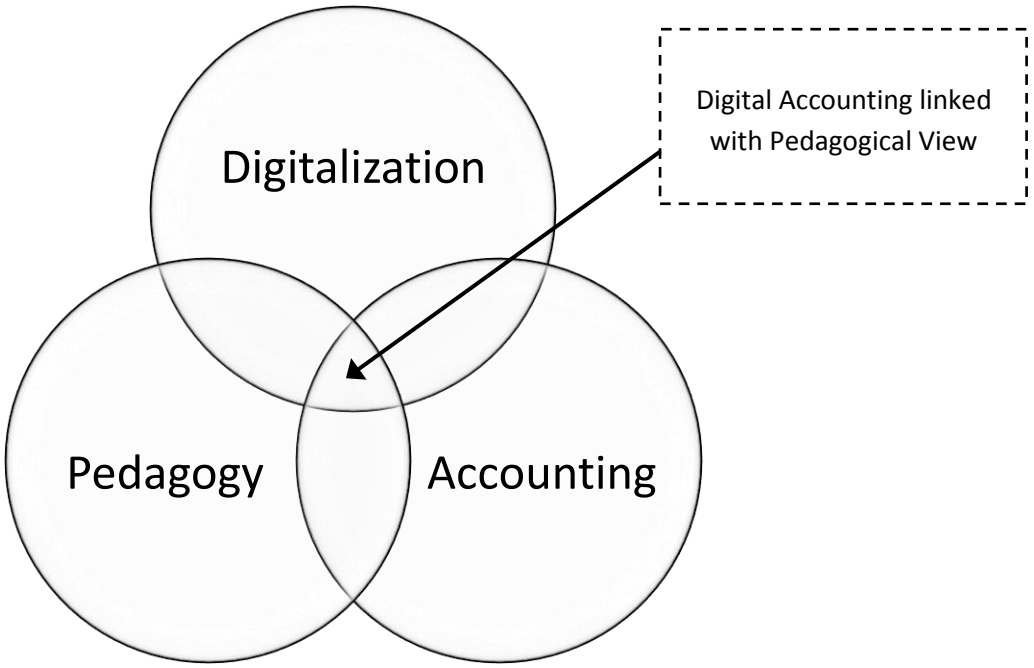

Figure 2.6. Area of the research

3 Data gathering, analysis and results

3.1 Selection of data

The process of collection articles for analysis was divided into database choice, data queries and manual selection of the articles. Decisions made are explained in the following chapters related to the process of the study.

3.1.1 Database Selection

To select articles for this study the Sciverse Scopus database was applied by the author. The Sciverse Scopus was launched in November 2004 by Elsevier and comprises over 69 million records from about 22 000 peer-reviewed journals (Scopus 2017), and 80% of the records include an abstract (Aghaei Chadegani et al. 2013), which is highly valuable for bibliometric study. It performs such features as search by document, author, affiliation, or advanced Search, and refine results by source type, year, language, author, affiliation and more. The Scopus database also allows to apply integrated tools for bibliometric analysis with various functionality - tracking citations over time for a set of authors or documents, viewing the h-index for specific authors, gaining insight into journal performance with CiteScore, SNIP and SJR, visualization of data, exporting to MS Excel (Scopus 2017).

These states are supported both by Saukko (2014) and Lukkari (2011) who came to the conclusion that Scopus could be used as the only database for bibliometric studies and still provide comprehensive results.

In addition to the Scopus, Google Scholar is an exciting database which is free and indexes scholarly literature across a wide array of disciplines, document types and languages (Martin-Martin, Orduna-Malea, Harzing & López-Cózar 2017) with citation counts principle similar with Scopus. Harzing and Alakangas (2016) state that Google Scholar provides the most comprehensive coverage and that coverage for the Scopus is similar. However, integrated tools for bibliometric study are very limited in comparison to Scopus and the majority of Google Scholars' records are

not peer-reviewed which leads to uncontrolled quality and ineffective manual data refine procedures to obtain relevant papers (Aguillo 2012). So, the author of the thesis did not make a decision in favor of Google Scholar.

Apart from the facts mentioned above, as database selection influences on citation counts and bibliometric indicators, usage of only one database improves the comparability of the articles and hence the accuracy of bibliometric analysis and validity of the research.

3.1.2 Data Queries and Article Selection

After the selection of database, the data searching step was conducted. Sciverse Scopus offers efficient tools to restrict searches to certain limits. In Scopus, the search was done by a query “digital accounting education” in title, abstract or keywords of articles. Also, some limitations were set up, such as publication year from 2000 to 2017, language – “English”, document type – “article or review”. The result was 31 articles, but during the manual analysis of titles and abstracts it was determined that most of them only slightly relate to the research area. After limitation by the subject area “business, management and accounting” only six articles remained. Among them one article was related to integration of technology in education in general, another one was linked with detecting plagiarism in spreadsheet accounting assignments, which is also not a focus of this research. Finally, 4 articles related to the topic were found in the Scopus database with the query.

These operations were done with other searching terms presented in Table 3.1. Queries with other search terms and limits were also tested but they were not included as they provided no articles about the area of the research.

Table 3.1. Results for different search queries related to the area of the study

Search term	Scopus
accounting education	1558

Search term	Scopus
teaching accounting	521
accounting curriculum	354
digital accounting	89
accounting pedagogy	75
digital accounting education	31
e-accounting	25
e-accounting education	5
digital accounting curriculum	1
non-paper accounting	1
e-accounting curriculum	0
non-paper accounting education	0

With the searching results, it was straightforwardly seen that most of the documents had nothing to do with the research topic. Many articles were dealing with narrow business problems related to digital accounting or usage of specific elements and many have used query to some diverse meaning. A manual article valuation was required to deliver the final list for this research. Documents were gauged using title, abstract and sometimes full text after getting search results. Only articles that dealt with curriculum of accounting disciplines and methods of teaching for accounting specialists were selected and then saved to Scopus list. The final list is presented in Appendix 1 and contains 46 articles. Further this list was exported in different formats to conduct the analysis and make visualization of the results.

3.2 Descriptive Analysis

Selected articles are examined in this chapter. These documents are evaluated by basic statistical techniques. Also, content analysis is conducted to realize the main idea of the articles and extract areas for further research.

3.2.1 Journals and Publication Years

In Figure 3.1 there are publication years of the selected articles. The publications of articles about digital accounting linked with a pedagogical view concentrated in years 2013 and 2016. When paying attention to the fact that most scientific articles are published one or two years after they have been written, it can be estimated that writing of these articles occurred in 2011-2015. Thus, the topic of digital accounting education was likely exciting to scholars mainly after the fast development of digital accounting tools when companies realized their need for updated accounting specialists. At the same time the deficit of published articles related to the topic could be identified before 2008 and in 2009.

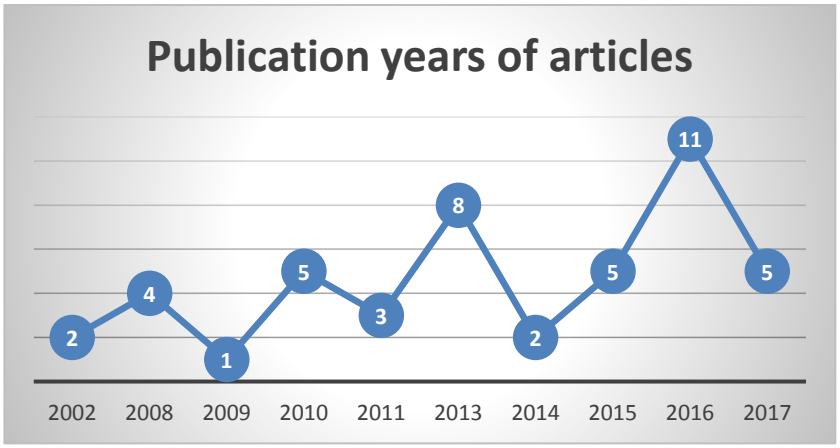

Figure 3.1. Publication years of the selected articles

The selected articles are from 15 different journals. Only four journals provide more than one article (Figure 3.2). Articles are mostly published in “Accounting education” journal, with the total number of 27 articles (58.7% of the total number

of articles in the final list). The reason for the popularity of this journal could be its direct relation to the specifics of research topic. Also, this journal has more than average number of publications in the period 2013-2015 in the main area "Business, management and accounting", the subarea "Accounting" (CWTS Journal Indicators, 2017).

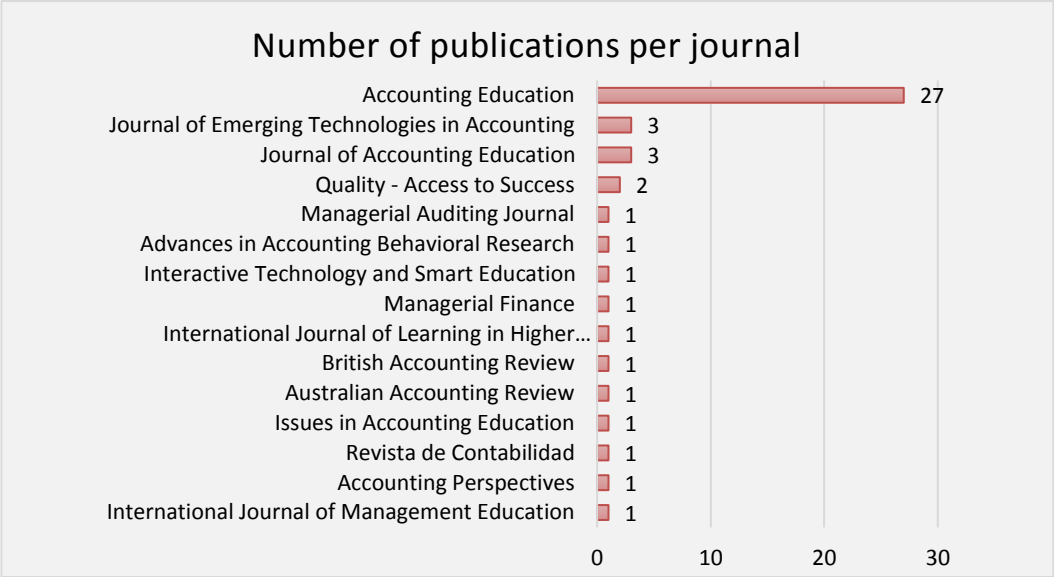

Figure 3.2. Journals concentration of the selected articles

In general, all the articles are in finance, management, accounting or education journals, which is not a surprise as not relevant publications were eliminated during the selection process. Table 3.2 shows SJR and SNIP indicators of journals with more than one article. A higher value of indicators means higher prestige and publication activity.

Table 3.2. The most active publishers in the field of research, 2016 (Scopus 2017; Scimago 2017; CWTS Journal Indicators 2017)

Journal	Publication forum level	SJR	SNIP	H-index	CiteScore
Accounting Education	1	0.530	0.532	20	0.83
Journal of Accounting Education	1	0.690	1.155	26	1.09
Journal of Emerging	1	0.161	0.648	6	0.86

Technologies in Accounting					
Quality - Access to Success	-	0.245	0.294	16	0.36

Publication Forum (Julkaisufoorumi) is a national Finnish system for assessing publications. It maintains and develops the classification of scientific publication channels (Helsinki University Library 2017). The base of the Publication Forum system is a qualitative classification of scientific publication channels in all scientific fields (Helsinki University Library 2017). All foreign journals in the table above, excluding “Quality - Access to Success”, have basic level 1, which means that they meet the following criteria: specialized in the publication of scientific or scholarly research outcomes; editorial board constituted by experts; entire manuscripts of scientific or scholarly articles or books subject to peer review; registered ISSN or ISBN number (Publication Forum 2017).

“Accounting Education” journal and “Journal of Accounting Education” are in the second quartile by SJR in the subject area “Business, Management and Accounting”, subject category “Accounting”, which means that these sources are not on the top of the list, however, their prestige is above average. Top 1 in this category is “Journal of Finance” with SJR 20,973. “Journal of Emerging Technologies in Accounting” and “Quality - Access to Success” have respectively low prestige. Based on SNIP among these four journals only “Journal of Accounting Education” shows high publication activity on the 34th place in the category list. “Journal of Finance” is #1 with publication activity 5.68.

“Accounting Education” journal and “Journal of Accounting Education” have the h-index 56 and 50 respectively which is also in the first half of the list with again “Journal of Finance” as a leader with h-index 233. It means that the above mentioned journals are cited by scholars actively. “Journal of Emerging Technologies in Accounting” and “Quality - Access to Success” are in the second half of the list, while the last source has h-index 6 which leads to the opposite conclusion.

According to Scopus, average citations received in 2016 per document published in the serial in the period 2013-2015 (CiteScore) for top-3 journals in the table are rather high (0,83-1,09). It shows that almost every publication of these journals is cited by scholars.

3.2.2 Authors and Affiliations

This part of the research provides the results of analysis to identify main contributors to the topic and their affiliations with universities and countries. Authors were selected based on the number of publications and citation counts in the final list of articles for this study.

Table 3.3 displays first authors who have more than one article in the list. For these authors h-indexes, citations and total citations are also provided. However, the h-index cannot be taken to evaluate researcher's influence on this certain topic as the number comprises also the scholar's other articles from various subject fields. The table also demonstrates the author's connections to universities.

Table 3.3. Affiliations, publication count and citations per author

First Author	Affiliation	Publications in the list	H-index	Citations based on articles in the list	Total citations
Binh Thanh Bui, Senior Lecturer in Accounting	Victoria University of Wellington, New Zealand	2	4	53	206
Gerard Stone, Program Director	University of South Australia	2	6	10	77
Jordi Carenys	EADA Business School, Barcelona, Spain	2	2	2	25

There are 46 first authors in the list of selected articles. However, only three of them have more than one article directly related to the research topic: Binh Thanh Bui, Gerard Stone and Jordi Carenys. They present Victoria University of Wellington, University of South Australia and EADA Business School. These associations were extracted from the articles with the help of Google Scholar.

The following table for affiliation analysis is compiled from first authors based on their citation count. In general, we can conclude that most cited authors in this specific research field are from American and Australian universities, however there are representatives with high impact at the UK and New Zealand universities. Binh Thanh Bui is the leader both in the number of publications and citation count in the list for research.

Table 3.4. Affiliations of authors selected based on citation count

First Author	Affiliation	Citations based on articles in the list
Bui, B.	Victoria University of Wellington, New Zealand	53
Lister, R.J.	University of Salford, UK	25
Cooper, B.J.	Deakin University, Australia	23
Abhayawansa, S.	Swinburne University of Technology, Australia	18
Jackson, S.	University of Colorado, USA	16
Holtzblatt, M.	Cleveland State University, USA	16
Peng, J.	Robert Morris University, USA	11
Stone, G.	University of South Australia, Australia	10

Chiang, B.	The College of New Jersey, USA	10
Palm, C.	Queensland University of Technology, Australia	9

Concentration per certain university (with more than one publication) is presented in the figure below.

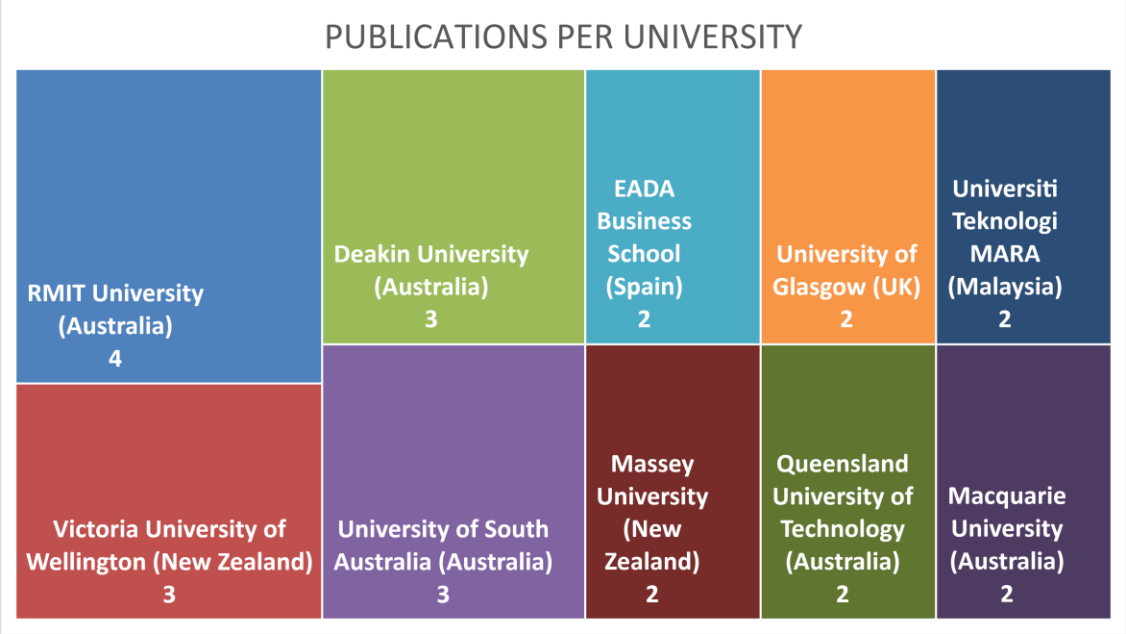

Figure 3.3. Publications per university

Figure 3.3 shows that the highest concentration of publications related to research topic is also in Australian universities (3 representatives in top four) – RMIT University, Deakin University and University of South Australia.

To find more confirmations to conclusions above it is necessary to conduct also country affiliation analysis for the whole sample of this research. Figure 3.4 presents the publication count per country. Data is gathered from Scopus. Scopus analyses how many affiliations articles have to a specific country. The same article can have multiple affiliations if it has multiple authors which are from different territories. If scholars are from the same country it is calculated as one connection. The chart shows all countries that have at least one connection.

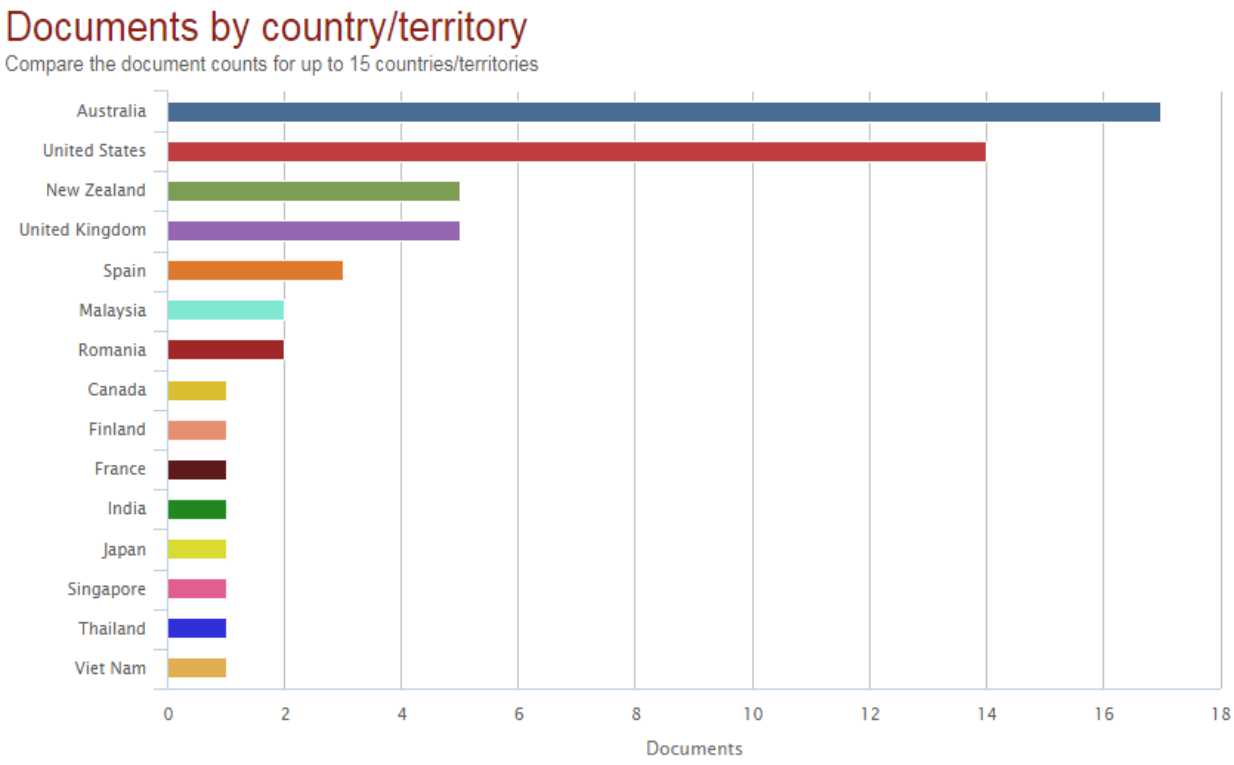

Figure 3.4. Publications per country

As we can see from the chart the study is concentrated in Australia and the United States (31 articles in total). The second echelon is New Zealand and the UK (10 articles in total). There are only seven publications both from continental European countries and from Asia-Pacific region. These results support previous assumptions. So, native English-speaking countries are leaders in the field of the study which could be due to the presence of strong professional accounting associations and institutions there.

3.2.3 Citations of the selected articles

Citation counts are usually applied to estimate an article's influence on scientific community. Figure 3.5 illustrates the selected articles with at least 7 citation counts divided by years.

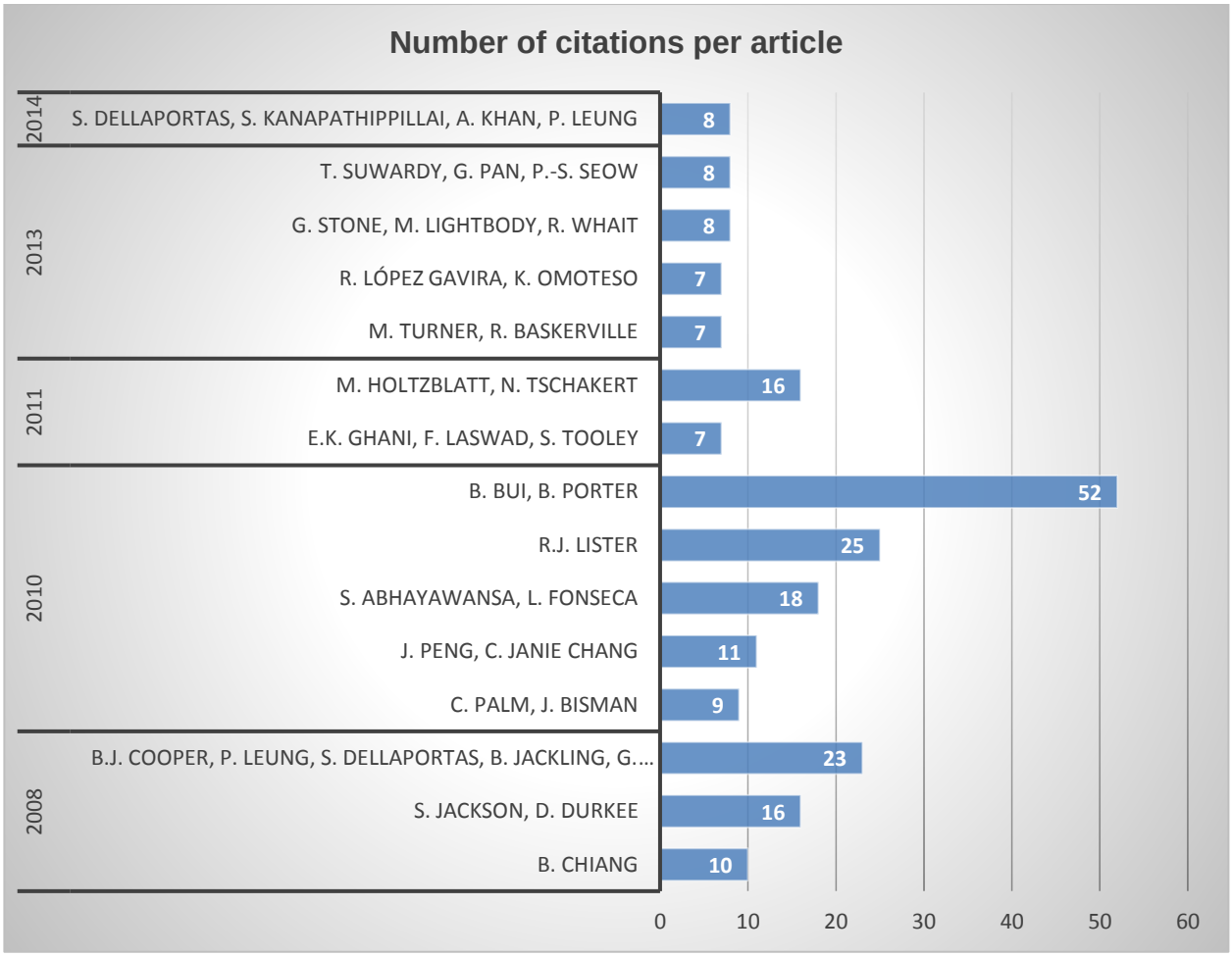

Figure 3.5. Number of citations per article

Bui and Porter (2010) have definitely the most cited article “The expectation-performance gap in accounting education: An exploratory study” with 52 citations. However, we should take into account the fact that at least top four articles were published 7-9 years ago and it could highly affect the results. The three most cited articles are focused on accounting education. Almost all articles on the chart were published in the “Accounting education” journal, except:

Peng and Janie Chang (2010) – “Accounting Perspectives” journal;

Ghani, Laswad, and Tooley (2011) – “British Accounting Review” journal;

Holtzblatt and Tschakert (2011) – “Journal of Accounting Education”.

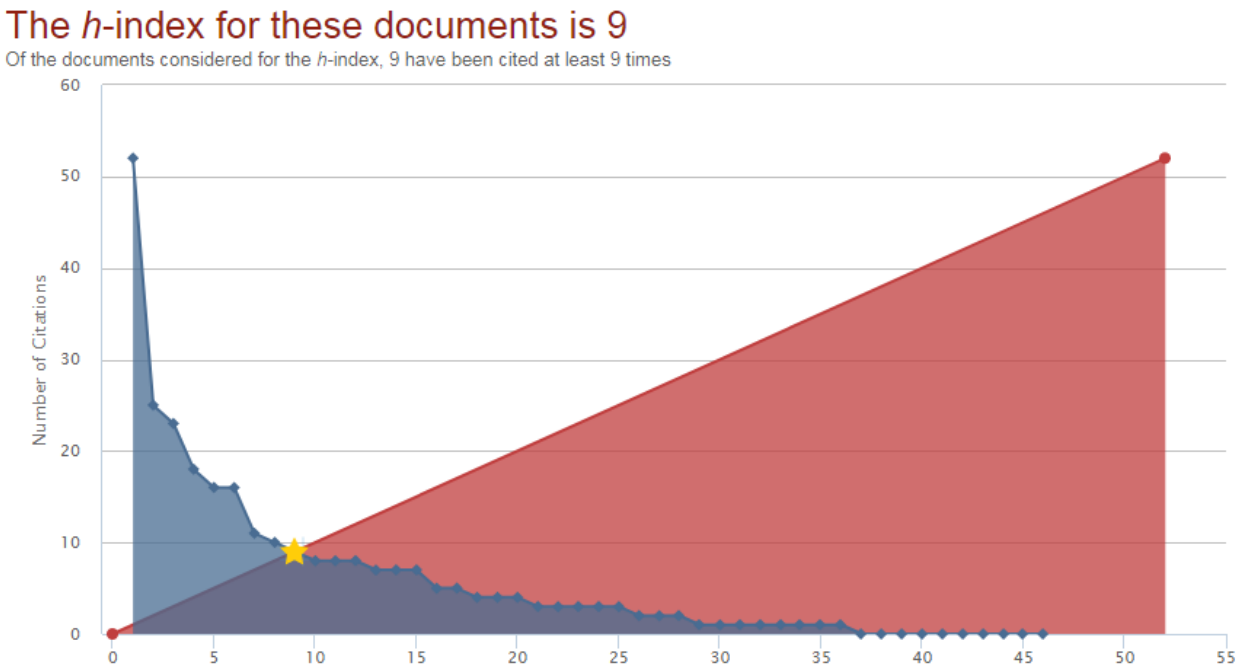

Figure 3.6. H-index for selected articles

The Hirsh-index of the list of selected articles is nine (Figure 3.6). It means that the sample of the research contains nine articles each of which have been cited at least nine times. The h-index graph is presented in the figure above.

3.2.4 Content Analysis

The content of every article from the list of 46 was analyzed in the framework of this research. Table 3.5 shows main parameters included in the analysis: listed aims, main research methods, data used, subject of the study, findings and areas for further research of the selected articles. As a first step an abstract was estimated, then a full text was appraised to extend information about the article. Because several articles (Stanciu & Bran 2015; Broadley & Taylor 2013; Andreica 2011) a full text was not accessible, content analysis was conducted with its abstracts.

Table 3.5. Content summary of the selected articles (source – articles in Appendix 1). Studies are arranged by publication year

Authors	Year	Title	Aim	Main method	Subject	Main findings/results	Areas for future research
Burdon, W.M., Munro, K.	2017	Simulation – is it all worth it? The impact of simulation from the perspective of accounting students	to reflect on the experiences of the module teaching team during the design, development and implementation stages of the simulation; to provide evidence of students' perceptions on the simulation	Simulation, survey	2 groups of final year accounting students	the majority of students consider the use of simulation material to aid understanding and to add value	to explore the provision of simulation within audit teaching focusing on student performance
Carenys, J., Moya, S., Perramon, J.	2017	Is it worth it to consider videogames in accounting education? A comparison of a simulation and a videogame in attributes, motivation and learning outcomes	to assess the effectiveness of videogames in comparison to simulations in a higher education environment and with regard to their attributes, motivation, and learning outcomes	video games, simulation, survey	students enrolled in an MSc Programme (Finance and Accounting) and an MBA in a Spanish business school	it is worth considering blending simulations and videogames in a single course, as the two tools are complementary in terms of their attributes and motivational effects	include in the research other types of learning outcome identified in previous literature; clarify if different approaches to combine distinct types of digital game yield different learning outcomes
Moilanen, S.	2017	The context-specific conceptions of learning in case-based accounting assignments, students' characteristics and performance	describing context-specific conceptions of learning related to case assignments, and exploring the associations between the conceptions of learning, students' characteristics and performance	secondary data	1320 learning diaries of 336 students	majority of the students seem to hold reproductive conceptions of learning	the different ways of using cases in teaching and their associations with conceptions of learning should be further explored

Bui, B., Hoang, H., Phan, D.P.T., Yapa, P.W.S.	2017	Governance and compliance in accounting education in Vietnam–case of a public university	to understand the impact of the education reform on the quality of university accounting education by investigating the involvement of different stakeholders in accounting education within one leading university in Vietnam.	interview	17 interviews with Ministry of Education and Training, the Ministry of Finance and other line ministries; professional accounting bodies; Big Four and other accounting firms; and business corporations who employ accounting graduates and accounting students. University management mainly includes deans of faculties, school managers and academics.	accounting education in Vietnam is driven by reduced state control, growing institutional autonomy and increasing external guidance.	more systematic review of accounting education reform to ensure that different stakeholders have better participation in both curriculum development and delivery
Paz, V.	2017	Innovative new apps and uses for the accounting classroom	to review several recent innovative technologies by providing brief descriptions, pricing, and current and potential uses	quasi-experimental research, survey	U.S. students registered in an introductory managerial accounting course over two semesters	Doceri improves overall course performance in an introductory managerial accounting class. Poll Everywhere app encourages questions and class discussions, improves participation among students, provides more illustrative examples.	adoption of any new classroom technology tools discussed

Carenys, J., Moya, S.	2016	Digital game-based learning in accounting and business education	to present a review of the accounting and business literature on digital game-based learning, to propose theoretical and empirical research questions within the accounting discipline	meta-analysis	54 scientific articles	important matters pointing to opportunities for accounting educators interested in DGBL remain	The construction of theoretical and conceptual frameworks that could inform digital game selection. An examination of how DGBL attributes affect engagement, motivation and the attainment of learning outcomes. The construction of theoretical and conceptual frameworks that could guide educator implementation of DGBL. An examination of the efficacy of using different learning activities to supplement digital games' use. An exploration of factors that foster or limit the adoption of DGBL. An assessment of DGBL learning outcomes from a more exogenous perspective. An evaluation of DGBL effectiveness involving different kinds of learners. The greater use of longitudinal DGBL studies. To evaluate the adequacy of videogames, virtual worlds, and MMPOG attributes, guide its deployment, and determine its effectiveness.

Khan, T., Kend, M., Robertso n, S.	2016	Use of social media by university accounting students and its impact on learning outcomes	to explore the use of social media by university accounting degree students to support their academic activities in an informal setting, evaluate the impact these media have on learning outcomes.	survey	126 first-year accounting degree students	university accounting degree students use social media for a number of academic-related purposes. Students establish and maintain fluid mentor/mentee relationships around academic activities related interactions through the social media. Use of Social Media is significantly associated with students' grades.	Use other type of questions and analysis for this research
Chan, S.H., Song, Q., Rivera, L.H., Trongmat eerut, P.	2016	Using an educational computer program to enhance student performance in financial accounting	to describe developed educational computer program PATH, compare it with Blackboard and paper medium systems and evaluate PATH's impact on students' intrinsic motivation	experiment	173 undergraduate students enrolled to introductory financial accounting course	relative to Blackboard and the traditional paper medium, educational computer program PATH leads to highest intrinsic motivation, which increases system use.	examine whether increased intrinsic motivation ensues when students are given control over certain elements of the instructional program; explore other attributes that can be included in educational computer games to promote learning of technical accounting materials.
Willis, V.F.	2016	A model for teaching technology: Using Excel in an accounting information systems course	to describe an instructional project within undergraduate Accounting Information Systems course that allows students to learn new functions in Microsoft Excel	experiment	students with such prerequisites as Intermediate Accounting I course and a computer class that covers basic business software including Excel	The project provides an example of an instructional resource that can be implemented in the accounting curriculum so students can strengthen both their Excel and presentation skills	Similar research in other countries (thesis author's suggestion)

Levant, Y., Coulmont, M., Sandu, R.	2016	Business simulation as an active learning activity for developing soft skills	to test whether business simulations contribute to the development of soft skills and whether gender, ethno-cultural origin, and professional experience affect the acquisition process	Simulation, survey	students enrolled in a business simulation course at a university or business school on French campuses (Paris, Lille, Nice) and abroad (Morocco)	business simulations benefit male and female students from various ethnic and cultural backgrounds, irrespective of whether or not they have any previous professional experience	more detailed studies of the cultural dimensions would shed light on the adaptability and usefulness of business simulations for particular ethno-cultural groups
Patel, C., Millanta, B., Tweedie, D.	2016	Is international accounting education delivering pedagogical value?	to examine whether universities are delivering pedagogical value to international accounting students commensurate with the costs of studying abroad	survey, interview	international students studying for a master's degree in accounting at a large metropolitan university in Australia	Chinese learners (CLs) have different learning approaches to local students, but not inferior or 'shallow' approaches. However, since CLs face distinctive financial and social pressures to achieve high results, their learning practices may be more sensitive to changes in teaching and assessment, such that cost constraints on educational resources might disproportionately affect their learning.	Similar research in other countries (thesis author's suggestion)

Dunn, K.A., Hooks, K.L., Kohlbeck, M.J.	2016	Preparing future accounting faculty members to teach	to investigate how accounting Ph.D. programs, prepare future accounting professors to fulfill their teaching responsibilities; to explore best practices for pedagogy training by identifying methods currently used for pedagogy training of accounting doctoral students and the perceived value of those methods	survey	75 recent accounting Ph.D. programs graduates	pedagogical knowledge and skills are primarily self-taught with most obtained from the process of teaching a course. The pedagogy training provided by accounting doctoral programs is perceived to cover important areas; however, on a relative basis, the amount of training is significantly less than its perceived importance. Novice teachers place highest value on training of skills that affect day-to-day teaching responsibilities.	investigation of how to prepare doctoral students to teach with providing a direct measurement of teaching improvement

Wan Jusoh, W.N.H., Ahmad, S.	2016	iMindMap as an innovative tool in teaching and learning accounting: an exploratory study	to explore the use of iMindMap software as an interactive tool in the teaching and learning method and also able to consider the iMindmap as an alternative instrument in achieving the ultimate learning outcome.	survey	97 students of the Management Accounting subject of Universiti Teknologi MARA	Results indicate that the majority of the students acknowledged that iMindMap is more attractive than conventional teaching methods and found that the iMindMap shows clearly how the points are all associated and linked together. Students could find that learning is an exciting experience and able to visualize the whole course content remarkably via iMindMap.	Future research may select two groups of students, one who learn using the iMindMap, while the other without the iMindMap. In addition, the future research may also analyse the impact of using iMindMap on students' performance, both in the examination and in the understanding the subject.

Ramachandran Rackliffe, U., Ragland, L.	2016	Excel in the accounting curriculum: perceptions from accounting professors	to specifically look at the issue (regarding whether there should be an emphasis on Excel in accounting education) by examining accounting faculty's perceptions of Excel in public accounting and accounting education.	survey	245 faculty members at over 100 accounting programs	a majority of faculty incorporate Excel in their accounting classes consistent with their perception of Excel importance. However, students are not fully proficient in Excel based on faculty's perceptions.	developing useful educational resources for accounting curriculum that include critical and analytical thinking tasks using Excel functions that could be deemed useful in a public accounting setting; to conduct semi-structured interviews and/or focus groups to explore some of the issues associated with the possible disconnection between faculty, students, and/or new hires at public accounting firms' (i.e. recent graduates) perceptions of Excel functional skills useful in public accounting and accounting education; explore issues pertaining to how a curriculum can balance Excel functional skills needed for the different types of career options in accounting; to examine the importance and usage of other spreadsheet products in the accounting profession and in the accounting classroom
Drum, D.M., Pulvermacher, A.	2016	Accounting automation and insight at the speed of thought	to describe unstructured case assignment for accounting students for improving MS Access and Excel skills	theoretical research	no subject	no findings	empirical study (thesis author's suggestion)

Coyne, J.G., Coyne, E.M., Walker, K.B.	2016	A model to update accounting curricula for emerging technologies	to identify relevant professional competencies and propose some corresponding actions by the academy to combine accounting, management information systems, and computer technology	theoretical research	current accounting curriculum	modified curriculum (Cloud computing, Data analytics, E-R diagrams, File systems, Hardware, Information life cycle, IT controls, NoSQL, Open source software, Operating systems, Process diagrams, Relational database model, Relational databases, SQL, Virtualization)	empirical study (thesis author's suggestion)
Thaker, K.	2015	Knowing, Doing and Being Pedagogy in MBA-level Management Accounting Classes: Some Empirical Evidence	This article argues for, and provides empirical support to, a pedagogy mix to complement prevalent case-based methods in a compulsory MBA program management accounting course. The article discusses field visits and field-based assignments, use of cases and role-play in effectively addressing the knowing, doing and being learning needs within an MBA program.	survey, case-study	229 students	The study demonstrates the effectiveness of field based, role play active learning pedagogical approaches in management accounting courses as a basis for generating improved student engagement and participation as compared to the application of case-based pedagogy alone.	to conduct study with direct evidence of improvement in the knowing, doing and being dimensions of learning

Tan, L.M., Laswad, F.	2015	Academic Performance in Introductory Accounting: Do Learning Styles Matter?	to examine the impact of learning styles on academic performance using major assessment methods (examinations and assignments including multiple-choice and constructed response questions (CRQs)) in an introductory accounting course.	experiment, survey	412 undergraduate business students enrolled in the first-year accounting course in a multi-campus New Zealand university	The results indicate that students' learning styles, after controlling for other variables, are associated with academic performance, particularly, in the final examination including both formats, multiple-choice questions and CRQs. Students who exhibit the 'assimilating' learning style appear to perform better in some of the assessments than students with 'diverging' or 'accommodating' learning styles.	Future research could explore the influence of other individual learning traits such as cognitive control, mental abilities and personality on student learning and mastery; future research could explore the merits and demerits of implementing flexible choice in the assessment format
Sangster, A., Fogarty, T., Stoner, G., Marriott, N.	2015	The Impact of Accounting Education Research	investigates the nature and patterns of usage of accounting education research in order to inform the debate on the value of this field, particularly in terms of its impact, and to provide practical advice to the academy	meta-analysis	47 papers	The paper contributes to the current debate on the quality of this research, and of research in accounting and finance in general.	similar studies which use the metrics of the Thomson Reuters two-year and five-year impact factors; comparative studies contrasting these findings with similar studies in other accounting research areas; questionnaire-based investigations and interview-based studies in which authors are asked about how they identify the research they cite in their work; and interview-based studies involving the editors of these specialist journals.

Stone, G., Fiedler, B.A., Kandunias, C.	2015	Harnessing Facebook for student engagement in accounting education: Guiding principles for accounting students and educators	proposes principles to guide accounting students' and accounting educators' use of Facebook as an educational resource to engage students with their learning.	theoretical research	no subject	social interactions can accompany academic interactions and produce positive learning outcomes by engaging students with their learning	refine, modify, and add to the guiding principles through further research and practical application in classes and subjects
Stanciu, V., Bran, F.P.	2015	The accounting profession in the digital era	to emphasize the impact of the information technology on the accounting profession and the need to adjust the universities' curriculum and instruction methods to the new professional requirements	theoretical research	no subject	highlights and new debates' topics on the accounting teaching in an IT environment	No information in abstract
Dellaportas, S., Kanapathippillai, S., Khan, A., Leung, P.	2014	Ethics education in the Australian accounting curriculum: A longitudinal study examining barriers and enablers	to investigate the nature of ethics education in the Australian accounting curriculum and how it has changed from 2000 to 2012; and to analyze the barriers to enhancing ethics education by soliciting the opinions of Heads of Departments/Schools of Australian universities	survey	Heads of 39 Schools and Departments of Accounting in Australia	The findings indicate that universities initially responded to the call for ethics education with increased levels of ethics interventions compared with early empirical Australian evidence, but have failed to improve in the intervening period in which the data were collected	research related with main question "how much ethics education is enough?"

Yap, C., Ryan, S., Yong, J.	2014	Challenges Facing Professional Accounting Education in a Commercialised Education Sector	this paper provides a case study of how accounting education, specifically a Master of Professional Accounting (MPA) programme, continues to fall short in meeting calls to produce graduates with the required graduate attributes. The paper provides a detailed analysis of how and why an MPA programme could be perfectly aligned in terms of what it professed to teach and what students perceived to have learnt, but failed to deliver the graduate attributes required by professional education, employers and government standards	case study, survey	current accounting curriculum	the documented programme and course outcomes and assessment activities were incongruent with the development of behavioural and higher-order cognitive skills. Student and graduate perceptions of their learning from the programme supported this finding. Desirable graduate attributes, as specified by employers, professional accounting associations and government regulators, were not aligned with the programme documentation and student/graduate perceptions.	applying the framework of this study for mapping curricula to assess the outcomes of revised accounting programmes; consider ways in which business schools might reconcile the tensions between research productivity, high quality teaching of large, diverse student cohorts, and revenue-generating imperatives.
Helliar, C.	2013	The Global Challenge for Accounting Education	to make overview of global challenge for accounting education	theoretical research	no subject	no findings	No information

Daff, L.	2013	Accounting Students' Reflections on a Course to Enhance their Interpersonal Skills	to provide an example of how to incorporate interpersonal skills into the accounting curriculum. Details are given on how to execute the course to promote effective, positive student outcomes.	action research	13 students' learning journals	The study finds students experienced initial apprehension and concern when practicing their interpersonal skills. However, as time elapsed, confidence grew, class dynamics changed, and significant improvements in students' communication and attitudes were evident.	further studies with larger groups of students and more than one researcher; to consider how the approach to curriculum change might be adapted for larger numbers of students; further research may incorporate evaluating communication apprehension alongside students' reflective journals; further research is required to determine where best to include interpersonal skills development in the accounting curriculum.
Turner, M., Baskervill e, R.	2013	The Experience of Deep Learning by Accounting Students	This study examines how to support accounting students to experience deep learning.	phenomeno graphic method, survey	81 students in a third-year undergraduate accounting course	it is possible to support a large proportion of students to experience deep learning through use of individualized, authentic assessed learning tasks with regular formative and summative feedback as part of an integrated set of interventions	to examine how to change the way accounting students learn in first-year courses and the transferability of these experiences to their subsequent courses

López Gavira, R., Omoteso, K.	2013	Perceptions of the Usefulness of Virtual Learning Environments in Accounting Education: A Comparative Evaluation of Undergraduate Accounting Students in Spain and England	to assess accounting students' perceptions of the usefulness of Virtual Learning Environments (VLE) to their learning experiences	survey	final-year undergraduate accounting students in two universities, one in Spain and the other in England	Although the results show that students from both countries find VLE tools and techniques useful for their learning, within the frame of the contingency theory of education, the study found that students' perceptions of the usefulness of VLEs are strongly dependent upon their country of study, due to the significant differences between Spanish and English students in five of the seven VLE contextual factors.	assessing the effects of VLEs on accounting graduates' performance in professional examinations subsequent to their graduation, and examining VLEs' impact on the learning experience of distance learning accounting students
Watty, K., Sugahara, S., Abayadeera, N., Perera, L.	2013	Developing a Global Model of Accounting Education and Examining IES Compliance in Australia, Japan, and Sri Lanka	to investigate how IES are perceived and valued by member bodies and academics in three counties: Australia, Japan, and Sri Lanka; to examine: (1) levels of awareness of IES; (2) drivers of compliance and convergence and non-compliance and non-convergence with IES; and (3) key factors influencing IES adoption.	survey, interview, case studies	57 academics from Australia, 9 academics from Sri Lanka and 87 academics from Japan	The case studies for each country provided a basis for developing the Global Model of Accounting Education. The unique features of each of the accounting education systems in Australia, Japan, and Sri Lanka were revealed as part of the case studies and by addressing questions in the model. Other findings are presented in the paper	Similar research in other countries (thesis author's suggestion)

Broadley, T., Taylor, G.	2013	Digital videos in financial accounting: A sociocognitive approach to learning	to gauge the effectiveness of the sociocognitive approach and consider student perceptions with regard to learning through this approach	survey	464 accounting undergraduate students	This research paper presents findings that indicate a positive and significant association between the number of times the videos were accessed, and the assignment score ($p<0.05$) was evident, suggesting that students that referred to the videos relatively frequently were able to utilize the knowledge gained from the videos to assist them in completing the assignment.	No information in abstract
Suwardy, T., Pan, G., Seow, P.-S.	2013	Using Digital Storytelling to Engage Student Learning	to describe an effort to engage students' visual and auditory senses with the help of digital story telling	survey	34 first year students aged between 18 and 20	the use of such digital stories can be an appropriate pedagogy to help student contextualize accounting and its role in helping management make decisions	to examine the effectiveness of digital storytelling in other accounting courses besides financial accounting (taxation, audit, etc.); examine the utility of the digital storytelling approach against alternative teaching and learning interventions

Stone, G., Lightbody, M., Whait, R.	2013	Developing Accounting Students' Listening Skills: Barriers, Opportunities and an Integrated Stakeholder Approach	describe approach to developing accounting students' listening skills	meta-analysis	literature and related research	this paper has proposed an integrated stakeholder approach to developing accounting students' listening skills	investigate educator and student use of virtual face-to-face communication technologies, such as Skype, as a method to develop the listening skills of external and distance learners; identify additional crossdisciplinary initiatives that may be applied by accounting educators to develop their students' listening skills; comparison of developing hard technical skills and soft generic skills.
Andreica, H.T.	2011	Accounting issues regarding digital economy	no information	no information	no information	no information	no information
Ghani, E.K., Laswad, F., Tooley, S.	2011	Functional fixation: Experimental evidence on the presentation of financial information through different digital formats	This study examines whether, in the presentation of financial information, digital formats address the concern over users' functional fixation	experimental task, survey	62 New Zealand accountants in public practice with experience in advising clients on investment matters	the use of digital formats to present financial reports does not fully overcome the issue of functional fixation in the processing of financial information	similar research with larger sample size; study of other XBRL benefits, such as the ability to compare more efficiently a large number of data for different organizations
Holtzblatt, M., Tschakert, N.	2011	Expanding your accounting classroom with digital video technology	to share experiences in exploring the use of digital video in teaching accounting and explain how numerous accounting professors are taking advantage of the capabilities afforded by digital video technologies.	observation	video content	suggestions for how accounting faculty can keep current with video technology	to examine how video technology improves knowledge acquisition and retention in accounting; to investigate factors that have driven faculty to explore the use of video technologies; experimenting with Skype and online videos within courses.

Abhayawansa, S., Fonseca, L.	2010	Conceptions of learning and approaches to learning-a Phenomenographic study of a group of overseas accounting students from Sri Lanka	This study explores conceptions of learning (SCL) and approaches to learning (SAL) of a group of Sri Lankan students studying accounting in an Australian university. The focus is on how cultural background and home country learning experiences shape SCL and SAL of these students.	phenomenographic method, interview	10 students enrolled in the Bachelor of Business (Accounting) degree at a metropolitan university in Melbourne	culture and prior learning experiences have influenced the formation of lower-order conceptions of learning in the respondents	to use quantitative research techniques (e.g. learning inventories) to investigate SAL of accounting students from this region and compare them to CHC students and Western students; to evaluate the impact of interventions that may be introduced based on this study's implications to assess the development of a deep approach in students; more phenomenographic research on accounting students from other countries in the Indian sub-continent can be conducted to evaluate similarities and differences in their SCL and SAL, and the influence of presage factors.
Lister, R.J.	2010	A Role for the compulsory study of literature in accounting education	to evaluate importance of literature in accounting education	theoretical research	no subject	Literature can make a multi-faceted contribution to education in accounting and cognate fields.	No information

Peng, J., Janie Chang, C.	2010	Applying XBRL in an accounting information system design using the REA approach: An instructional case	to examine the transforming process in the hypothetical case by following a resource-event-agent (REA) modeling paradigm to create a database; to examine the learning effectiveness of using this case on students' understandings of REA modeling and of XBRL.	case study, survey	Undergraduate students taking an AIS course at two state universities	the students agreed that the case was interesting, good learning experience, helped understand REA modeling, and helped understand XBRL	similar study in different conditions (thesis author's suggestion)
Bui, B., Porter, B.	2010	The expectation-performance gap in accounting education: An exploratory study	to propose a framework of accounting education's expectation-performance gap; to report an exploratory study designed to test the proposed framework	case study, survey	(a) partners and recruitment managers from accounting firms which had employed graduates from the case study programme in both 2004 and 2005; (b) recent graduates from the case study programme; (c) accounting lecturers who teach courses in the case study programme; (d) final year students pursuing the case study programme who intend to join public accounting firms upon graduation.	identification of ways in which the gap may be narrowed	how the institutional constraints might be reduced or removed

Palm, C., Bisman, J.	2010	Benchmarking introductory accounting curricula: Experience from Australia	to report on the results of an exploratory study of issues (narrow content, technical focus, use of transmissive models of teaching, and inattention to the development of students' generic skills) in introductory accounting which involved the review of subject outlines and prescribed textbooks, and the conduct of a cross-sectional survey of the introductory accounting teaching coordinators in Australian universities	survey	introductory accounting teaching coordinators in 21 Australian universities	traditional approaches to subject content and delivery continue to dominate, with limited indicators of innovations to enhance the diversity and quality of learning experiences and learning outcomes	to experiment with a range of innovative and emerging educational and assessment strategies that can be effectively implemented within the context of traditional curricula and conventional learning environments
Robson, G.S., Shin, Y.B., Wilson Mixon, J.	2009	Estimating accounting and finance models with Microsoft Excel	to propose a way to introduce regression analysis into courses with minimal start-up time.	discuss	Excel workbook	The workbook provides a set of macros that guides students through the implementation of ordinary least squares (OLS) estimation and provides them with information that is not part of standard Excel output. It also conducts high-low analysis.	No information

Milner, M.M., Hill, W.Y.	2008	Support for graphicacy: A review of textbooks available to accounting students	to report on a survey that examined the textbooks available to students attending two Scottish universities	survey	180 accounting textbooks	The findings highlight a lack of support for graphicacy in the textbooks selected. The study concludes that accounting educators need to scrutinize more closely the selection of textbooks and calls for more extensive research into textbooks as a pedagogic tool.	Similar research in other countries (thesis author's suggestion)
Jackson, S., Durkee, D.	2008	Incorporating information literacy into the accounting curriculum	This article illustrates the relevance of information literacy concepts to accounting students, and describes the collaborative approach used by librarians and accounting faculty at Weber State University (WSU) to incorporate information literacy into the accounting curriculum.	case study, survey	100 students	students demonstrate an increased level of information literacy competency and an augmented appreciation for the value of information in personal, work, and academic settings.	Similar research in other countries (thesis author's suggestion)
Chiang, B.	2008	Integrating a service-learning project into management accounting coursework-a sharing of implementation experience and lessons learned	to explain the experience of incorporating service-learning projects into management accounting classes and to share insights learned from the implementation processes.	experiment, survey	103 students	most of the students appreciate the opportunity to conduct a real-life project and found that the project helped them in understanding accounting concepts.	similar research with larger sample size (thesis author's suggestion)

Cooper, B.J., Leung, P., Dellaportas, S., Jackling, B., Wong, G.	2008	Ethics education for accounting students-a toolkit approach	to stimulate discussion and debate on the subject of ethics education and includes the provision of an Ethics Education Toolkit to encourage and assist accounting educators and member bodies of IFAC to implement ethics education programmes.	experiment survey	group of accountancy students	the students themselves highly valued the ethical issues course they undertook. In fact, they appear to value the ethics course more highly than all other compulsory courses in the degree, as evidenced in the teaching scores and feedback comments.	Similar research in other countries (thesis author's suggestion)
Hunton, J.E.	2002	The impact of digital technology on accounting behavioral research	stir the imagination of behavioral researchers with respect to emerging research opportunities brought about by the infusion of advanced information and communication technologies (ICT) into business and accounting environments; to offer insight with regard to how ICT can be used to strengthen the internal validity of behavioral experiments, as well as research productivity.	theoretical research	no subject	summary of previous articles' findings	No information
Doost, R.K.	2002	The need for change in the way we teach accounting information systems	to present authors over two decades experience in teaching accounting information systems, his success and failure.	theoretical research	no subject	summary of the experience	No information

To visualize the methods used in the studies (Table 3.5), these methods were classified and presented in Table 3.6. In the intersection cells table 3.6 shows the number of studies based on the certain method (if the title of the column and the row is the same) or combination of methods. An article written by Andreica (2011) was excluded from the method analysis due to lack of information in its abstract and unavailability of the full text.

Table 3.6. Popular research methods and their combinations

METHODS OF STUDY	ACTION RESEARCH	CASE STUDY	DISCUSS	EXPERIMENT	INTERVIEW	META-ANALYSIS	OBSERVATION	PHENOMENOGRAPHIC METHOD	SECONDARY DATA	SIMULATION	SURVEY	THEORETICAL RESEARCH
ACTION RESEARCH	1											
CASE STUDY											6*	
DISCUSS			1									
EXPERIMENT				2							5	
INTERVIEW					1						1*	
META-ANALYSIS						3						
OBSERVATION							1					
PHENOMENOGRAPHIC METHOD					1						1	
SECONDARY DATA									1			
SIMULATION											3	
SURVEY											10	
THEORETICAL RESEARCH												8

* - the study was based on three methods: case study, survey, interview. The point is counted only in the cell "Case study/Survey"

As we can see from the table above the most popular method of study is survey, which is applied both as the only method of research and in combination with others. There are 10 articles where authors used only survey, 6 articles based on case study and survey (including one with case study, survey and interview), 5

articles with combination of survey and experiment or quasi-experiment, and 3 articles in which simulation and survey were applied by scholars. Another method of research the topic of digital accounting from pedagogic perspective is a theoretical study which was used in 8 documents. Also, meta-analysis, phenomenographic method and experiment solo could be highlighted, while other methods, such as action research, discuss, interview, observation, secondary data, are in similar proportion.

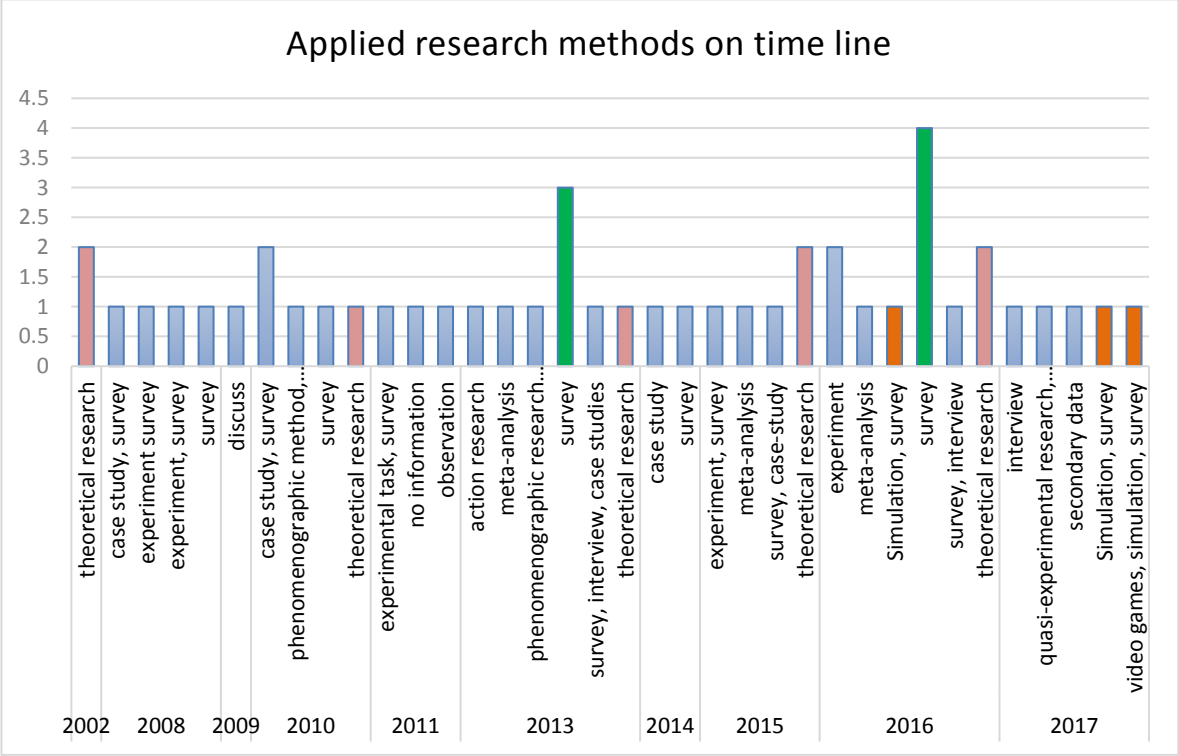

Figure 3.7. Applied research methods distributed by years

It is necessary to also mention (Figure 3.7) that the simulation method (orange bars) is presented only in recent years' articles – 2016 and 2017, and the research of these articles has likely started in 2014-2015. Thus, Burdon et al. (2017) studied the impact of simulation from the perspective of final year accounting students. Levant et al. (2016) examined business simulation as a learning activity for developing soft skills of business school students in France and Morocco. Carenys et al. (2017) compare simulation and video games approach regarding the effect on the educational process. The probable reason of such distribution of simulation

method could be the spreading of availability of comprehensive simulation tools in educational institutions in the period 2013-2014 and the rise of scholars' interest in this instrument in the education process.

The concentration of the solo survey (green bars) method happened in 2013 and 2016. Moreover, the range of topics is mostly concerned with digital tools for accounting classes, including using digital storytelling to enhance student engagement (Suwardy et al. 2013), virtual learning environments in accounting education (Lopez 2013), usage of digital videos within financial accounting courses (Broadley & Taylor 2013), use of social media to support academic activities (Khan et al. 2016), iMindMap as an innovative tool in teaching and learning accounting (Wan Jusoh & Ahmad 2016), and Excel in the accounting curriculum (Ramachandran & Ragland 2016).

In addition, at the beginning of the century only theoretical studies (pink bars) were conducted to discuss global changes related to digitalization in business and they formed a foundation for new theoretical concepts – Hunton (2002) and Doost (2002). However, starting from 2010 theoretical studies were distributed evenly and conducted every 2-3 years – Lister (2010), Helliar (2013), Stone, Fiedler and Kandunias (2015), Stanciu and Bran (2015), Drum and Pulvermacher (2016), Coyne, Coyne and Walker (2016).

As the area of the research relates to the field of accounting education, the majority of scientific papers in Table 3.5 have accounting students or their learning diaries as a research subject. However, there are also scholars who chose as a subject of study partners and recruitment managers from accounting firms, accounting textbooks (Milner & Hill 2008), academics and representatives of educational institutions (Palm & Bisman 2010; Watty 2013; Dellaportas et al. 2014; Ramachandran & Ragland 2016; Bui et al. 2017), accounting practitioners (Ghani et al. 2011; Bui et al. 2017), previous scientific papers (Stone et al. 2013; Sangster et al. 2015; Carenys & Moya 2016), and accounting curriculum (Yap et al. 2014; Coyne et al. 2016).

3.3 Reliability and Validity of the Study

The Master's thesis is limited by using only one database for bibliometric study – Sciverse Scopus. This database has enormous number of peer-reviewed scientific journals presented, including directly related to the research topic. Other advantages of this choice were presented in Chapter 1.5. It should be mentioned that it could be possible to use alternative databases such as Google Scholar to find more articles, however, probably they would not be peer-reviewed articles. And dubiously it could lead finally to weighty number of articles after procedures of selection. Nevertheless, different set of database limitations can be considered as an area for future research.

This research is generally limited to articles that deal with the two aspects of the "digital accounting linked with pedagogical view" topic - contribution to curriculum of accounting disciplines and methods of teaching for higher engagement and better results of accounting specialists. Other types of scientific records, such as conference papers, short surveys, and books, were not taken into consideration, which reveals another area for further studies.

One more aspect to mention is the selection of articles. A manual article valuation was required to deliver the final list for this research as nowadays there is no smart instrument to filter unconnected documents. Documents were gauged using title, abstract and sometimes full text after getting search results. In research for field of social sciences such subjective approach of qualitative data evaluation is a normal practice. In the framework of this research applied selection methods can be considered as reliable enough. The development of AI software for automatization of article selection by the content analysis based on defined filters could be a breakthrough technology with very high business potential, and also area of a plenty of studies.

Construct validity determines proper operational measures for the examined concepts. To reinforce the validity, three separate approaches can be applied. First

of all, multiple sources of evidence should be employed. This approach is not implemented in the research, as only one database is used.

The next approach is to determine a chain of evidence, which means to ensure that a reader can track without difficulty any evidence on the way from a research question to its answer. This can be achieved by the following points:

- sufficient citations to the database in the paper;

- the database should disclose the factual evidence and the conditions of the data gathering;

- data collection should be performed according to procedures.

Thus, this approach is designed in the study effectively as the author describes every of the analysis steps which are in logical sequential order, and in the framework of the content analysis citations were directly taken from the articles, and the evidence can be easily found from the primary source. Also, the data gathering and selection has followed the procedures established.

The third approach is related to revision. In this paper, the supervisor has reviewed the work which can enhance the construct validity.

External validity defines the domain to which the study´s findings can be generalized. Generalization of this study is limited due to the specific factor of the research method – bibliometric study. A significant sample increase may lead to different results of the analysis. Moreover, it should be mentioned that generalization was not the objective of the bibliometric study.

4 Discussion and conclusions

The publications of articles about digital accounting linked with the pedagogical view centred around years 2013 and 2016 years. When paying attention to the fact that most scientific articles are published one or two years after they have been written, it can be disclosed that writing of these articles occurred in 2011-2015. Thus, the topic of digital accounting education was exciting to scholars mainly after the fast development of digital accounting tools when companies realized their need in updated accounting specialists. At the same time the deficit of published articles related to the topic could be identified in the period before 2008 and in 2009.

The selected articles for the research were published in 15 different journals. Only four journals provide more than one article - “Accounting Education” journal, “Journal of Accounting Education”, “Journal of Emerging Technologies in Accounting” and “Quality - Access to Success”. Articles are mostly published in the “Accounting education” journal, with the total number of 27 articles (58.7% of the total number of articles in the final list). The reason for the popularity of this journal could be its direct relation to the specific nature of the research topic. Also, this journal has more than the average number of publications in the period 2013-2015 in the main area “Business, management and accounting”, the subarea “Accounting” (CWTS Journal Indicators, 2017). “Journal of Accounting Education” and “Journal of Emerging Technologies in Accounting” are both sources for 3 scientific papers from the list, whilst “Quality - Access to Success” provided only 2 articles. In general, all the articles are in finance, management, accounting or education journals, which is not a surprise as not relevant publications were eliminated during the selection process. “Accounting Education” journal, “Journal of Accounting Education” and “Journal of Emerging Technologies in Accounting” have Publication forum level 1, which means that they meet certain criteria. The majority of all publication channels are classified as the basic level (Publication Forum 2017).

“Accounting Education” journal and “Journal of Accounting Education” are on the second quartile by SJR in the subject area “Business, Management and Accounting”, subject category “Accounting”, which means that these sources are not on the top of the list, however, their prestige is above average. “Journal of Emerging Technologies in Accounting” and “Quality - Access to Success” have respectively low prestige. Based on SNIP among these four journals only “Journal of Accounting Education” shows high publications activity on the 34th place in the category list. “Accounting Education” journal and “Journal of Accounting Education” have the h-index 56 and 50 respectively which is also in the first half of the list. It means that the above mentioned journals are cited by scholars actively. “Journal of Emerging Technologies in Accounting” and “Quality - Access to Success” are in the second half of the list, while the last source has h-index 6 which leads to the opposite conclusion. According to Scopus, average citations received in 2016 per document published in the serial in the period 2013-2015 (CiteScore) for “Accounting Education” journal, “Journal of Accounting Education” and “Journal of Emerging Technologies in Accounting” are 0.83, 1.09 and 0.86 respectively. It points out that almost every publication of these journals is cited by scholars.

There are 46 first authors in the list of selected articles. However, only three of them have more than one article directly related to the research topic: Binh Thanh Bui, Gerard Stone and Jordi Carenys. They present Victoria University of Wellington, University of South Australia and EADA Business School. Based on our analysis, most cited authors in this specific research field are from American and Australian universities, however there are representatives with high impact at the UK and New Zealand universities. Binh Thanh Bui is the leader both in the number of publications and citation count in the list for research.

The highest number of publications related to the research topic is from Australian universities – RMIT University, Deakin University and University of South Australia. This conclusion is supported by country analysis as the study is centred in Australia and the United States (31 articles in total). The second echelon is New Zealand and the UK (10 articles in total). There are only seven publications both

from continental European countries and from Asia-Pacific region. So, native English-speaking countries are leaders in the field of the study which could be due to the presence of strong professional accounting associations and institutions there.

Bui and Porter (2010) have undoubtedly the most cited article “The expectation-performance gap in accounting education: An exploratory study” with 52 citations. However, we should take into account the fact that at least top four articles from the least were published 7-9 years ago and it could highly affect the results of scientific impact analysis. The three most cited articles - Bui and Porter (2010), Lister (2010), Cooper, Leung, Dellaportas, Jackling, and Wong (2008) - are focused on accounting education. Almost all articles with more than seven citations were published in the “Accounting education” journal, except:

Peng and Janie Chang (2010) – “Accounting Perspectives” journal;

Ghani et al. (2011) – “British Accounting Review” journal;

Holtzblatt and Tschakert (2011) – “Journal of Accounting Education”.

The results of scrutinized content analysis were presented in Chapter 3.2.4. To summarize some points related to the research questions it is necessary to mention that almost half of the articles (n=21), especially recent ones, are devoted to implementation of digital tools in accounting education. Thus, Burdon and Munro (2017) studied impact of simulation based on perceptions of 2 groups of final year accounting students. Articles of Carenys, Moya and Perramon (2016, 2017) are also devoted to simulation in comparison with videogame as well as digital game-based learning. Levant, Coulmont and Sandu (2016) aimed to test whether business simulations contribute to the development of soft skills and whether gender, ethno-cultural origin, and professional experience affect the acquisition process.

Video and audio content impact in education was examined by Broadley and Taylor (2013) with data gathered from 464 accounting undergraduate students,

and Suwardy, Pan and Seow (2013). Both papers provide positive results regarding using this teaching tool within accounting courses. Holtzblatt and Tschakert (2011) aimed to share experiences in exploring the use of digital video in teaching accounting and explain how numerous accounting professors are taking advantage of the capabilities afforded by digital video technologies.

Classical accounting digital instrument, as MS Office, was also investigated by scholars as a tool to contribute in students' skill set. Willis (2016) described in his study an instructional project within undergraduate Accounting Information Systems course that allows students to learn new functions in Microsoft Excel, Drum and Pulvermacher (2016) presented an unstructured case assignment for improving MS Access and Excel skills, Robson (2009) proposed a way to introduce regression analysis as Excel workbook with macros set. A broad survey was made by Ramachandran and Ragland to look at the issue regarding whether there should be an emphasis on Excel in accounting education, however it showed that despite of the vast incorporating Excel in accounting classes student still have weaknesses in Excel proficiency.

A pool of innovative software and apps in accounting education contains Doceri, Poll Everywhere, Top Hat, nClass, Asana, educational computer program PATH, iMindMap, etc. These approaches to improve accounting education were applied by Paz (2017), Chan, Song, Rivera and Trongmateerut (2016), Wan Jusoh and Ahmad (2016). Some researchers (Khan, Kend & Robertson 2016; Stone, Fiedler & Kandunias 2015) examined even the use of social media for increasing engagement and improving learning outcomes of students, and concluded that social interactions can accompany academic interactions and produce positive learning outcomes by engaging students with their learning. Coyne, Coyne and Walker (2016) proposed a model to update accounting curricula by combining accounting, management information systems, and computer technology. As per scholars modified accounting curriculum should include Cloud computing, Data analytics, E-R diagrams, File systems, Hardware, Information life cycle, IT controls, NoSQL, Open source software, Operating systems, Process diagrams, Relational

database model, Relational databases, SQL, Virtualization. Lopez and Omoteso (2013) assessed accounting students' perceptions of the usefulness of Virtual Learning Environments (VLE) to their learning experiences. Although the results show that VLE tools are useful for students' learning, the study found that students' perceptions of the usefulness of VLEs are strongly dependent upon their country of study. Ghani et al. (2011) devoted their study to one more relatively novel tool, XBRL (eXtensible Business Reporting Language), and aimed to examine whether, in the presentation of financial information, digital formats address the concern over users' functional fixation. Peng and Janie Chang (2010) studied the learning effectiveness of using the instructional case on students' understandings of a resource-event-agent modeling and of XBRL.

Along with aspects mentioned above such areas as use of case studies, ethics considerations, learning styles, accounting profession in digital era, and others were explored by scholars.

The most popular method to study digital accounting from the pedagogical view is survey, which is applied both as the only method of research and in combination with others. There are 10 articles where authors used only survey, 6 articles based on case study and survey (including one with case study, survey and interview), 5 articles with combination of survey and experiment or quasi-experiment, and 3 articles in which simulation and survey were applied by scholars. Another approach to research the topic "digital accounting from the pedagogic perspective" is a theoretical study which was used in 8 documents. Also, meta-analysis, phenomenographic method and experiment solo could be highlighted, while other methods, such as action research, discuss, interview, observation, secondary data, are in similar proportion.

It is necessary to also mention that the simulation method is presented only in recent years' articles – 2016 and 2017, and the research of these articles has likely started in 2014-2015. Thus, Burdon et al. (2017) studied the impact of simulation from the perspective of final year accounting students. Levant et al. (2016) examined business simulation as a learning activity for developing soft skills of

business school students in France and Morocco. Carenys et al. (2017) compare simulation and video games approach regarding the effect on the educational process. The probable reason of such distribution of the simulation method could be the spreading of availability of comprehensive simulation tools in educational institutions in the period 2013-2014 and the rise of scholars' interest in this instrument in the education process.

The concentration of the solo survey method occurred in 2013 and 2016. Moreover, the range of topics is mostly concerned with digital tools for accounting classes, including using digital storytelling to enhance student engagement (Suwardy et al. 2013), virtual learning environments in accounting education (Lopez 2013), usage of digital videos within financial accounting courses (Broadley & Taylor 2013), use of social media to support academic activities (Khan et al. 2016), iMindMap as an innovative tool in teaching and learning accounting (Wan Jusoh & Ahmad 2016), and Excel in the accounting curriculum (Ramachandran 2016).

In addition, at the beginning of the century only theoretical studies were conducted to discuss global changes related to digitalization in business and they formed a foundation for new theoretical concepts – Hunton (2002) and Doost (2002). However, starting from 2010 theoretical studies were distributed evenly and conducted every 2-3 years – Lister (2010), Helliar (2013), Stone et al. (2015), Stanciu and Bran (2015), Drum and Pulvermacher (2016), Coyne et al. (2016).

As the area of the research relates to the field of accounting education, the majority of scientific papers use accounting students or their learning diaries as a research subject. However, there are also scholars who chose as a subject of study partners and recruitment managers from accounting firms, accounting textbooks (Milner & Hill 2008), academics and representatives of educational institutions (Palm & Bisman 2010; Watty 2013; Dellaportas et al. 2014; Ramachandran & Ragland 2016; Bui et al. 2017), accounting practitioners (Ghani et al. 2011; Bui et al. 2017), previous scientific papers (Stone et al. 2013; Sangster et al. 2015; Carenys & Moya 2016), and accounting curriculum (Yap et al. 2014; Coyne et al. 2016).

Based on content analysis we can highlight that areas of further research in many cases are rather specific and narrow, and it would be more beneficial to rely on the results presented in the Chapter 3.2.4 as manual categorization may distort it. Nevertheless, for general understanding of the issue examples of future research fields are given:

- more systematic review of accounting education reform to ensure that different stakeholders have better participation in both curriculum development and delivery (Bui et al. 2017);

- adoption of any new classroom technology tools discussed (Paz 2017);

- more detailed studies of the cultural dimensions would shed light on the adaptability and usefulness of business simulations for particular ethno-cultural groups (Levant et al. 2016);

- investigation of the educator and student use of virtual face-to-face communication technologies, such as Skype, as a method to develop the listening skills of external and distance learners (Stone et al. 2013);

- comparison of developing hard technical skills and soft generic skills in the framework of accounting education (Stone et al. 2013);

- investigation of how to prepare accounting doctoral students to teach with providing a direct measurement of teaching improvement (Dunn et al. 2016);

- examining how to change the way accounting students learn in first-year courses and the transferability of these experiences to their subsequent courses (Turner & Baskerville 2013);

- examining how video technology improves knowledge acquisition and retention in accounting (Holtzblatt & Tschakert 2011);

- investigation of the factors that have driven a faculty to explore the use of video technologies (Holtzblatt & Tschakert 2011).

Besides that, there is a pool of recommendations and the thesis author's suggestions to conduct similar studies within different circumstances – in other countries, with a larger sample size, with different conditions of experiment. It should also be noted that some papers did not disclose possible areas for research.

The summary of answers to the research questions discussed in the introduction are briefed in Table 4.1. It may be inferred that the research problem and questions have been studied appropriately in this paper. A clear notion to scientific articles within a defined period and related to digital accounting linked with the pedagogical view was created by this Master's thesis.

Table 4.1. The research questions and main conclusions

Research question	**Main Conclusion**
External attributes of the articles	
1. How are articles placed in time?	Publications of articles have been maximal in 2013 and 2016 years. The topic was probably exciting to scholars when companies realized their need for updated accounting specialists. The deficit of published articles related to the topic could be identified before 2008 and in 2009.
2. Has the research concentrated on specific researchers, journals or institutions?	Articles are mostly published in the "Accounting education" journal - 58.7% of the total number of articles analyzed. Three authors have more than one article directly related to the research topic: Binh Thanh Bui, Gerard Stone and Jordi Carenys. They present Victoria University of Wellington, University of South Australia and EADA Business School accordingly. The highest concentration of publications is in Australian

	universities – RMIT University, Deakin University and University of South Australia. Native English-speaking countries (Australia, USA, New Zealand, UK) are leaders by the number of publications in the field of the study which could be due to the presence of strong professional accounting associations and institutions there.
Internal attributes of the articles	
3. What are the most important (the most cited or otherwise high quality) articles about the topic?	Bui, B. & Porter, B. 2010, "The expectation-performance gap in accounting education: An exploratory study", Accounting Education, - 52 citations. Lister, R.J. 2010, "A Role for the compulsory study of literature in accounting education", Accounting Education, - 25 citations. Cooper, B.J., Leung, P., Dellaportas, S., Jackling, B. & Wong, G. 2008, "Ethics education for accounting students - a toolkit approach", Accounting Education, - 23 citations.
4. What has been studied about digital accounting from the pedagogical perspective?	Digital tools in accounting education: Simulation, digital game-based learning, video and audio content, MS Access and Excel, Doceri, Poll Everywhere, Top Hat, nClass, Asana, educational computer program PATH, iMindMap, Virtual Learning Environments, XBRL. Other areas: use of case studies, ethics considerations, learning styles, accounting profession in digital era, etc.
5. What research methods and data have been used?	The most popular method of study is survey, which is applied both as the only method of research (n=10) and in combination with case study (n=6), experiment (n=5)

	and simulation (n=3). Another method of research is theoretical study which was used in 8 documents. Also, meta-analysis (n=3), phenomenographic method (n=2) and experiment solo (n=2) could be highlighted, while other methods, such as action research, discuss, interview, observation, secondary data, are in similar proportion. Most scientific papers have accounting students or their learning diaries as a research subject. However, there are also scholars who chose as a subject of study partners and recruitment managers from accounting firms, accounting textbooks, academics and representatives of educational institutions, accounting practitioners, previous scientific papers, and accounting curriculum.
Future research areas	
6. What areas could be interesting for future research?	Areas for future research include: - experiments with and adoption of different well known and innovative digital tools and teaching methods within various disciplines of accounting education, in different countries, with different specific and size of the sample; - studies related to improving the ecosystem of accounting education, including closer collaboration with all stakeholders, restructuring of curriculum and educational program, selection of learning materials.

Figures

Tables

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APPENDIX 1

The list of selected articles for the research

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